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(54) **KNOCKDOWN APPARATUS FOR COMPILING RECORDING MEDIA IN FINISHER**

KNOCKDOWNVORRICHTUNG ZUM KOMPILIEREN VON AUFZEICHNUNGSMEDIEN BEI EINEM
FINISHER

PRESSOIR POUR COMPILER DES SUPPORTS D'IMPRESSION DANS UN DISPOSITIF DE
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- **RAISANEN, Matthew**
Vancouver, Washington 98683 (US)
- **ROHMAN, Stephen Thomas**
Vancouver, Washington 98683 (US)

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(74) Representative: **Plasseraud IP**
66, rue de la Chaussée d'Antin
75440 Paris Cedex 09 (FR)

(73) Proprietor: **HEWLETT-PACKARD DEVELOPMENT
COMPANY, L.P.**
Spring, TX 77389 (US)

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(72) Inventors:

- **KIM, Taehong**
Suwon-si Gyeonggi-do 443-742 (KR)
- **LO, Kevin**
Vancouver, Washington 98683 (US)

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Description

BACKGROUND

[0001] A finisher refers to an apparatus for processing a recording medium, such as paper, supplied from an image forming apparatus. The finisher can be connected to the image forming apparatus to receive the recording medium during a job, and is in communication with the image forming apparatus. For example, the finisher may perform a stapling operation, an alignment operation, and/or a folding operation with respect to the recording medium supplied from the image forming apparatus. US2013249160A1, US2016060065A1, JP2008001485A and JP2013193870A disclose sheet processing devices.

[0002] An image forming apparatus refers to an apparatus that forms images on a recording medium according to inputted signals. Examples of an image forming apparatus include a printer, a copy machine, a scanner, a facsimile, and a multifunction peripheral device that combines and implements various functions of the printer, copy machine, scanner, and/or facsimile. Examples of a printer include an inkjet printer or a laser printer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003]

FIG. 1 is a schematic structural diagram of an image forming apparatus and finisher according to an example;

FIG. 2 is a block diagram of the printer and the finisher according to an example;

FIGS. 3A-3B are schematic cross-sectional views of the finisher according to an example;

FIG. 4A is a perspective view illustrating a plurality of paddle units coupled to a rotatable shaft according to an example;

FIG. 4B is a side view illustrating a driving source coupled to a rotatable shaft according to an example;

FIG. 5 is a perspective view of a knockdown device, according to an example;

FIG. 6 is a side view of a knockdown device, according to an example;

FIGS. 7A-7B are enlarged views of a tamper and knockdown device according to an example;

FIG. 8 is perspective view of a knockdown device, according to an example;

FIG. 9 is a perspective view of a knockdown device, according to an example;

FIG. 10 is a side view of a knockdown device, according to an example;

FIG. 11 is a perspective view of a knockdown device, according to an example;

FIG. 12 is a view illustrating cams in contact with a knockdown device, according to an example;

FIGS. 13 and 14 are perspective views illustrating a

rotatable shaft and cams from a rear side of an upper paper guide, according to an example;

FIG. 15 is a perspective view of a knockdown device, according to an example;

FIG. 16 is a side view of a knockdown device, according to an example;

FIGS. 17A and 17B are side views of the knockdown device in an upper position and a lower position, respectively, according to an example; and

FIG. 18 is a perspective view of a knockdown device, according to an example.

DETAILED DESCRIPTION

[0004] Before a recording medium is compiled and a finishing operation is performed on the recording medium by a finisher, an image forming apparatus may perform a conditioning process on the recording medium. For example, the conditioning process may remove water, smooth the recording medium, or a combination thereof. The conditioning process may be more difficult when there is a significant amount of ink placed on the recording medium. To remove the water from the recording medium, a temperature of a heated pressure roller within the image forming apparatus may be raised, however the increase temperature can result in a curled or "smiling" recording medium.

[0005] When the curled "smiling" recording medium is transported to a compiler area of the finisher, the curled "smiling" recording medium can fill the compiler area. The compiler area may include paddles to pull a recording medium toward an end portion of a registration tray for a finishing operation to be performed on the recording medium. However, because the recording medium is curled, this may prevent the paddles from pulling the recording medium toward the end portion of the registration tray. Thus, a finishing operation may have poor compiling of recording media, the finishing operation may be poorly performed on the recording media, and a size of a stack of recording media for which the finishing operation is to be performed on may be limited.

[0006] According to various examples of the disclosure, a finisher includes a knockdown apparatus which knocks down a recording medium during the compiling process of the recording medium so as to flatten the recording medium and eliminate or decrease the curl. Because the curl can be decreased or eliminated, a job quality of compiled media stacks may be improved, increased temperatures may be utilized in the image forming apparatus to remove moisture from a recording medium, and a stack capacity may be increased.

[0007] Various examples of the disclosure will now be described with reference to the accompanying drawings, wherein like reference characters denote like elements. Examples to be explained in the following may be modified and implemented in various different forms.

[0008] When it is stated in the disclosure that one element is "connected to" or "coupled to" another element,

the expression encompasses not only an example of a direct connection or direct coupling, but also a connection with another element interposed therebetween. Further, when it is stated herein that one element "includes" another element, unless otherwise stated explicitly, it means that yet another element may be further included rather than being excluded.

[0009] FIG. 1 is a schematic structural diagram of an image forming apparatus and finisher 400 according to an example. Referring to FIG. 1, the image forming apparatus includes a printer 100 and a scanner 300 coupled to a finisher 400.

[0010] The printer 100 prints an image on a sheet-type medium, which may also be referred to as a recording medium, provided from a paper feeder. The paper feeder may be, for example, a main cassette feeder 210 installed under the printer 100, or secondary cassette feeders 220 and 230 installed under the main cassette feeder 210. Although not illustrated, the paper feeder may further include a multi-purpose tray (MPT), a high capacity feeder installed at a side of the printer 100, or a combination thereof.

[0011] The printer 100 may also include a control panel 130 to receive an input from a user to control the image forming apparatus, for example to perform a function of the image forming apparatus. The control panel 130 may include a keyboard, a button, a display, or combinations thereof for the user to operate the image forming apparatus. The display may be a touchscreen to receive the input from the user.

[0012] The printer 100 may print an image on a recording medium by using various printing methods such as an electrophotography method, an inkjet method, a thermal transfer method, and a thermal sublimation method. For example, the image forming apparatus may print a color image on the recording medium by using an inkjet method. The printer 100 may be a S path-type of printer or a C path-type of printer, for example.

[0013] The scanner 300 reads an image recorded on a document. The scanner 300 may have any of various structures such as a flatbed mechanism where a document is at a fixed position and an image is read while a reading member is moved, a document feeding mechanism where a reading member is at a fixed position and a document is fed, and a combination structure thereof.

[0014] The finisher 400 may include a sheet folding device (not illustrated) for folding, one or more times, the recording medium discharged from the printer 100. The finisher 400 may further include an alignment device (not illustrated) for aligning the recording medium discharged from the printer 100. The alignment device may have a structure for stapling the recording medium at an end portion thereof or punching a hole in an end portion of the recording medium. The finisher 400 may further include a stapler for stapling the paper at a center portion thereof. Other example processes or functions the finisher 400 may perform include hole punching, binding, embossing, gluing, coating, varnishing, foil stamping,

texturing, lamination, cutting, creasing, stacking, binding, splicing, rewinding, or combinations thereof.

[0015] FIG. 2 is a block diagram of the printer 100, the finisher 400, and an external device 700, according to an example. In FIG. 2, the printer 100 includes controller 110 and machine readable storage 120, the finisher 400 includes controller 410 and machine readable storage 420, and the external device includes controller 710 and machine readable storage 720. The finisher 400 also includes a driving source 430 and a sensor 440 which will be discussed in more detail below. The driving source 430 may include a motor, solenoid, other electromechanical devices, or combinations thereof. The sensor 440 may include a position sensor that senses a position of a recording medium on a path in the finisher, a weight sensor, a proximity sensor, a light sensor, or combinations thereof.

[0016] The finisher 400 may include a controller 410 and machine readable storage 420. The controller 410 may execute instructions stored in the machine readable storage 420. The printer 100 may also include a controller 110 and machine readable storage 120. The finisher 400, the printer 100, and the external device 700 may be connected with one another in a wired and/or wireless manner such that the finisher 400, printer 100, and external device 700 can communicate with one another to exchange information, including job information regarding an image forming job performed or to be performed by the image forming apparatus including the printer 100 and scanner 300, a finishing job performed or to be performed by the finisher 400, or combinations thereof.

[0017] The controllers 110, 410, 710 may include, for example, a processor, an arithmetic logic unit, a central processing unit (CPU), a graphics processing unit (GPU), a digital signal processor (DSP), an image processor, a microcomputer, a field programmable array, a programmable logic unit, an application-specific integrated circuit (ASIC), a microprocessor, or combinations thereof.

[0018] The machine readable storages 120, 420, 720 may be any electronic, magnetic, optical, or other physical storage device that stores executable instructions. For example, the machine readable storages 120, 420, 720 may include a nonvolatile memory device, such as a Read Only Memory (ROM), Programmable Read Only Memory (PROM), Erasable Programmable Read Only Memory (EPROM), and flash memory, a USB drive, a volatile memory device such as a Random Access Memory (RAM), a hard disk, floppy disks, a blue-ray disk, or optical media such as CD ROM discs and DVDs, or combinations thereof.

[0019] The external device 700 may include a personal computer, a laptop, a tablet, a smartphone, a server, or combinations thereof. The external device 700 may be used to control the finisher 400, the printer 100, or combinations thereof. For example, the external device 700 may receive an input from a user regarding a job or function of the finisher 400, the printer 100, or combinations thereof. The external device 700 may include a user in-

terface 730 to receive the input and a display 740 to display information regarding the finisher 400 and the printer 100. The user interface 730 may include, for example, a keyboard, a mouse, a joystick, a button, a switch, an electronic pen or stylus, a gesture recognition sensor, an input sound device or voice recognition sensor such as a microphone, an output sound device such as a speaker, a track ball, a remote control, a touchscreen, or combinations thereof. The external device 700 may also include a display 740.

[0020] FIGS. 3A-3B are schematic cross-sectional views of the finisher according to an example.

[0021] Example paths traveled on by the recording medium in the finisher 400 will now be described. The recording medium is received by the finisher 400 from the printer 100 at an input port 451. Depending on the design of the finisher 400 and the processes to be performed on the recording medium, there may be numerous paths that the recording medium may be transported on before being output to an output bin. For example, as illustrated in FIG. 3A, a diverter 452 may divert the recording medium to an upper path 453 or a lower path 454 for the recording medium to be output to an upper output bin 455 or a lower output bin 456. Various rollers and other devices may contact and handle a recording medium within the finisher 400. The rollers and other devices may be driven by various motors, solenoids, and other electromechanical devices, which can be controlled via the controller 410 of the finisher 400, the controller 110 of the printer 100, or a controller located elsewhere, or by a combination thereof.

[0022] As illustrated in FIG. 3A, the finisher 400 includes an upper output bin 455 and a lower output bin 456. The upper output bin 455 may be utilized for simple jobs in which a finishing process or collated stacking is not performed. For example, a recording medium may be transported along the upper path 453 to be output to the upper output bin 455 when a stapling operation is not performed on the recording medium. The lower output bin 456 may be utilized for jobs for which a stacking or stapling operation is performed. For example, a recording medium may be transported along the lower path to be output to the lower output bin 456 when a stapling operation is performed on the recording medium. The lower output bin 456 may be movable. For example, the lower output bin 456 may be lowered or raised. The lower output bin 456 may be lowered or raised depending on a number of recording media that are held by the lower output bin 456.

[0023] When a finishing process is to be performed with respect to a recording medium and the recording medium is transported along the lower path 454, the recording medium may be transported to a section of the finisher 400 referred to as a compiler 500. The compiler 500 may include a stapler 510 to staple the recording medium to another recording medium or to recording media before the stapled media is ejected or discharged from the compiler 500 and output to the lower output bin

456. The compiler 500 may also include a register tray 520, a pusher bar 550 and a tamper 560 (see FIG. 5), to be described in more detail below.

[0024] FIG. 4A is a perspective view illustrating a plurality of paddle units 530 coupled to a rotatable shaft 540 according to an example. FIG. 4B is a side view illustrating a driving source coupled to a rotatable shaft according to an example. The compiler 500 includes the paddle units 530 coupled to the rotatable shaft 540 as shown in FIG. 4A.

[0025] As illustrated in FIG. 4A each of the paddle units 530 includes a plurality of paddles 531. The plurality of paddle units 530 coupled to the rotatable shaft 540 may be located at spaced apart intervals along the rotatable shaft 540 in an axial direction of the rotatable shaft 540. The plurality of paddles 531 can be at spaced apart intervals, circumferentially about the respective paddle unit 530. Each of the paddles 531 extends in a radial direction outward from the paddle unit 530 and rotatable shaft 540. For example, there may be three paddle units 530 coupled to the rotatable shaft 540. Each of the paddle units 530 may include two paddles 531 at spaced apart intervals, circumferentially about the respective paddle unit 530. However, the disclosure is not so limited and there may be more than three paddle units 530 or less than three paddle units 530. Furthermore, there may be more than two paddles 531 on a respective paddle unit 530, or less than two paddles 531. For example, there could be a single paddle unit 530 coupled to the rotatable shaft 540 where the paddle unit 530 has a single paddle 531. The paddle 531 may be made of polyurethane. However, the paddle 531 may be made of another material. For example, the material of the paddle 531 may be selected based on frictional characteristics. For example, the material of the paddle 531 may be selected so that the recording medium may be pulled back to the end portion 521 of the register tray 520 efficiently. As shown in FIG. 4A, the paddle 531 may have a substantially rectangular shape.

[0026] The driving source 430 may include a motor, a solenoid, another electromechanical device, or combinations thereof. For example, as illustrated in FIG. 4B the driving source 430 may include a motor 431, a gear 432 coupled to the rotatable shaft 540, and a driving belt 433 coupling the motor 431 to the gear 432 to drive rotation of the rotatable shaft 540 according to a signal output from the controller 410. The rotatable shaft 540 may be rotated in a first direction and a second direction by the driving source 430. The first direction may be referred to as a "forward" direction and the second direction may be referred to as a "reverse" direction. The first direction may be a clockwise direction and the second direction a counterclockwise direction. Or the first direction may be a counterclockwise direction and the second direction a clockwise direction. The paddles 531 rotate together with the rotation of the rotatable shaft 540. Because the paddles 531 are coupled to the rotatable shaft 540, when the rotatable shaft 540 is rotated in the forward

direction, the paddles 531 rotate together with the rotatable shaft 540 in the forward direction. When the paddles 531 are rotated in the forward direction during a compiling operation, the paddles 531 compile a recording medium in a direction toward an end portion 521 of the register tray 520 so that the recording media, which are stacked on top of one another, are aligned at the end portion 521 of the register tray 520 and can be stapled together by the stapler 510 in a defined manner. As a number of recording media accommodated in the register tray 520 increases, a height of the compiled stack of recording media also increases.

[0027] An example path along which the recording medium travels to the compiler 500 will now be described with respect to FIG. 1. For example, with reference to FIGS. 3A and 3B the recording medium may pass through a pair of exit rollers 457 and drop down to the register tray 520. An exit roller sensor 441 located at or near the exit rollers 457 can detect a position of the recording medium. The exit roller sensor 441 may also be referred to as position sensor 441. The sensor 440 can include the exit roller sensor 441. For example, the exit roller sensor 441 can detect when the recording medium arrives at the exit rollers 457, passes through the exit rollers 457 to the register tray 520, or a combination thereof. The exit roller sensor 441 may send a signal to the controller 410 indicating a position of the recording medium. For example, the signal may indicate the recording medium has arrived at the exit rollers 457 or has passed through the exit rollers 457 to the register tray 520. In this way the controller 410 can determine how many recording media are accommodated in the register tray 520 during a finishing operation. For example, the controller 410 can include a counter to count or index the number of recording media that have arrived at the exit rollers 457 or passed through the exit rollers 457 during the finishing operation.

[0028] As the recording medium drops down from the exit rollers 457 to the register tray 520 the pusher bar 550 may rotate to push downward against a trailing edge of the recording medium to assist the recording medium in dropping down to the register tray 520. When the recording medium is located on the register tray 520 the rotatable shaft 540 and paddles 531 may rotate in the forward direction. For example, during the compiling of the recording medium, the controller 410 may transmit a signal to the driving source 430 to control the driving source 430 to rotate the rotatable shaft 540 in the forward direction. Also, when the recording medium is located on the register tray 520 the tamper 560 may be moved in an inward direction toward opposite sides of the recording media to align the stacked recording media in a widthwise direction of the recording medium. The tamper 560 may be moved in the inward direction toward opposite sides of the recording media a plurality of times to align the stacked recording media in the widthwise direction.

[0029] FIG. 5 is a perspective view of a knockdown device 800 coupled to an upper paper guide 570 of the

compiler 500 according to an example. FIG. 6 is a side view of the knockdown device 800 coupled to the upper paper guide 570 of the compiler 500 according to an example. The compiler 500 includes a knockdown device 800 to knock down a recording medium during the compiling process of the recording medium so as to flatten the recording medium and eliminate or decrease a curl in the recording medium. As shown in FIG. 6, a body of the knockdown device 800 includes one end coupled to a pin 571 installed in the upper paper guide 570 such that the knockdown device 800 is rotatable about the pin 571 similar to a hinge. The pin 571 can be provided in a groove or slot 572 of the upper paper guide 570. As another example, the pin 571 may be provided on an end of the knockdown device 800 as a rotatable knockdown shaft of the knockdown device 800, and inserted into the groove or slot 572 of the upper paper guide 570. The upper paper guide 570 may be mounted inside a main body of the finisher. For example, the upper paper guide 570 may be mounted or coupled to a frame of the finisher. Two knockdown devices 800 can be coupled to the upper paper guide 570, for example. For example, the knockdown devices 800 can be positioned to knockdown the recording medium on opposite sides of the recording medium in the widthwise direction. For example, each knockdown device 800 can extend outward from the upper paper guide 570 at a location between a tamper 560 and a paddle 531 coupled to the rotatable shaft 540. The knockdown device 800 may be located at a position spaced apart from the tamper 560 such that the tamper 560 does not strike the knockdown device 800 when the tamper 560 moves inward to align the sides of the recording media stacked in the registration tray during compiling of the recording media. In another example to be further described below, the tamper 560 may contact the knockdown device. For example, when the tamper 560 moves inward the tamper 560 may slide under the knockdown device 800 and cause the knockdown device 800 to rotate upward. When the tamper 560 moves outward the knockdown device 800 then rotates back downward by the force of gravity.

[0030] As shown in FIG. 6, the knockdown device 800 is rotatable about the pin 571 to rotate between a resting or lower position P1 and an upper position P3. An intermediate position P2 is also shown in FIG. 6. In the resting position P1, the knockdown device 800 may be spaced apart from the register tray 520 in a vertical direction. An angle of the knockdown device 800 in the resting position P1, for example relative to a plane perpendicular to a rotation axis of the pin 571, or a height of above the registration tray 520, may be set according to a force to be applied to the recording medium in the downward direction and the pulling force of the paddles 531 which pull the recording medium toward the end portion of the register tray 520. If the register tray 520 contains recording media, depending on a height of the stack of recording media, in the resting position P1 the knockdown device 800 may rest on an upper surface of a top recording me-

dium of the stack of recording media, or the knockdown device 800 may be spaced apart from the upper surface of the top recording medium of the stack of recording media.

[0031] When the knockdown device 800 is in the resting position P1 and a recording medium is transported from the exit rollers 457 to the register tray 520 in the compiler 500, the recording medium may be partially ejected in an outward direction toward the lower output bin 456, before being pulled back in toward the end portion 521 of the register tray 520 by the paddles 531 of the compiler 500. When the recording medium is partially ejected in the outward direction toward the lower output bin 456, a leading edge of the recording medium contacts inner sides of the knockdown devices 800 and causes the knockdown devices 800 to rotate upward. An amount of rotation of the knockdown devices 800 in the upward direction may be depend on various factors including the force applied to the knockdown devices 800 by the recording medium according to the speed of travel of the recording medium, a weight of the recording medium, a weight of the knockdown device 800, or combinations thereof, for example. After the knockdown devices 800 swing upward, the knockdown devices 800 then rotate downward by a force of gravity to apply a downward force on an upper surface of the recording medium. The knockdown devices 800 may apply the downward force on the upper surface of the recording medium as the recording medium is being pulled back toward the end portion of the register tray 520. Therefore, the knockdown device 800 can reduce a curl in the recording medium when in the resting position and also by applying a downward force when the knockdown device 800 rotates downward and contacts the upper surface of the recording medium.

[0032] The knockdown device can have various shapes. For example, the knockdown device may have a substantially rectangular shape as shown by the knockdown device 800' illustrated in FIG. 8. As another example, as illustrated in FIGS. 7A-7B, the knockdown device 800 may have a first portion 800A that extends at one end outward from the upper paper guide 570, a second portion 800B that has one end bent downward from the other end of the first portion 800A, and a third portion 800C that has one end bent upward from the other end of the second portion 800B.

[0033] A width of the knockdown device in the widthwise direction may also be varied. For example, a wider width of the knockdown device 800' compared to the knockdown device 800 in the widthwise direction may allow the knockdown device 800 to contact a greater area of the recording medium and to contact different types of recording media with narrower widths.

[0034] A weight of the knockdown device along a direction perpendicular to the widthwise direction and an axial direction of the rotatable shaft may also be varied. For example, a first end of the knockdown device, opposite of a second end of the knockdown device coupled to the upper paper guide 570, may have a greater weight

compared to the second end of the knockdown device coupled to the upper paper guide. The greater weight of the first end of the knockdown device may allow a greater downward force to be applied to the recording medium.

[0035] FIGS. 7A-7B are enlarged views of the tamper 560 and knockdown device 800 according to an example. As mentioned above, in an example the tamper 560 may contact the knockdown device. For example, as shown in FIGS. 7A and 7B, when the tamper 560 moves inward the tamper 560 may engage ramps 820 on an outer side of the knockdown device 800 to lift the knockdown device 800 out of the way. The ramps 820 may extend from the second end of the knockdown device 800 in an inward direction such that the knockdown device 800 is tapered, with the second end of the knockdown device 800 being wider than the first end of the knockdown device 800 in the widthwise direction. The tamper 560 slides under the knockdown device 800 and causes the knockdown device 800 to rotate upward. When the tamper 560 moves outward the knockdown device 800 then rotates back downward. Because the knockdown device 800 can be lifted by the tamper 560, the knockdown device 800 may be located further outward and closer to the tamper 560.

[0036] FIG. 8 is perspective view of knockdown device 800' according to an example. As shown in FIG. 8, the first end of the knockdown device 800', opposite of the second end of the knockdown device 800' coupled to the upper paper guide 570, includes roller wheels 810. The roller wheels 810 can reduce a friction force between the knockdown device 800' and the upper surface of the recording medium. The reduced friction force may allow the paddles 571 to more easily pull the recording medium toward the end portion 521 of the register tray 520. As shown in FIG. 8, the first end of the knockdown device 800' has two roller wheels 810. However, a single roller wheel or more than two roller wheels may be provided at the first end of the knockdown device. Although not shown, the knockdown device 800 illustrated in FIGS. 5 to 7B also includes roller wheels 810 at the first end of the knockdown device 800.

[0037] Accordingly, the rotatable knockdown devices 800 and 800' shown in FIGS. 5 through 8 can knock down the recording medium during the compiling process of the recording medium so as to flatten the recording medium and eliminate or decrease a curl in the recording medium.

[0038] FIG. 9 is a perspective view of a knockdown device 900 in an upper position and coupled to an upper paper guide 570 of the compiler 500, according to an example. FIG. 10 is a side view of the knockdown device 900 in a lower position, according to an example. FIG. 11 is another view of the knockdown device 900 coupled to the upper paper guide 570 of the compiler 500 according to an example. The knockdown 900 includes a body 901 that is elongated in a direction perpendicular to a rotation axis of the rotatable shaft 540. A length of the body 901 may be chosen in consideration of a range of widths of recording mediums that may be processed by

the finisher 400 balanced with avoiding contacting with the tamper 560 during the compiling operation, for example. In FIG. 9, one end of each of the arms 902a, 902b extends from the body and the other end of each of the arms 902a, 902b is coupled to the upper paper guide 570.

[0039] The knockdown device 900 is mounted to the upper paper guide 570. For example, each arm 902a, 902b is coupled to the upper paper guide 570 by a rotatable knockdown shaft 904a, 904b that is formed as a protrusion or pin which protrudes from an outer side of each of the arms 902a, 902b. The rotatable knockdown shafts 904a, 904b are inserted into a groove or pinhole 572 that is formed in a portion of the upper paper guide 570. The knockdown device 900 is rotatable about the rotatable knockdown shafts 904a, 904b, such that a rotation axis of the knockdown device 900 is parallel to and offset from a rotation axis of the rotatable shaft 540.

[0040] The upper paper guide 570 may include a cutout or recess 573 formed therein to accommodate the arms 902a, 902b and body 901 of the knockdown device 900 when the knockdown device 900 is in an upper position. The ability to store the knockdown device 900 in the recess 573 while the knockdown device 900 is not being utilized allows the knockdown device 900 to avoid contact with a recording medium being compiled as well as recording media stacked in the register tray 520. Also, a sound-dampening material may be provided in the recess 573 so that when the knockdown device 900 returns to the upper position, a noise may be reduced or minimized. A sound-dampening material can also be provided on an upper side of the knockdown device 900. The sound-dampening material may include an acoustic foam, for example.

[0041] To retain the knockdown device 900 in the upper position, an elastic member 907 may be coupled between a hook 574 formed in the upper paper guide 570 and a receptacle 905 provided in an end portion or tab 906a of arm 902a of the knockdown device 900, as shown in FIG. 14 according to an example. The arm 902b of the knockdown device 900 also includes an end portion or tab 906b. The elastic member 907 may be an extension spring for example.

[0042] A plurality of ribs 903 are formed on a lower surface of the knockdown device 900. The ribs 903 protrude from the lower surface of the knockdown device 900 such that when the knockdown device 900 contacts the recording medium a surface area of the knockdown device 900 that contacts the recording medium is less than a surface area of the knockdown device 900 that contacts the recording medium when no ribs are provided. Therefore, a noise level caused by the knockdown device 900 striking the recording medium can be reduced. The knockdown device 900 may be made of plastic, for example.

[0043] The knockdown device 900 may include surfaces which are chamfered, curved, or angled in such a way to reduce a noise associated with rotating the knockdown in an upward and downward motion. For example, the

body 901, the arms 902a, 902b, the ribs 903, or a combination thereof, may have curved surfaces.

[0044] FIG. 12 is a view illustrating cams 541a, 541b in contact with tabs 906a, 906b of the knockdown device 900, according to an example. The knockdown device 900 can be rotated by rotation of the cams 541a, 541b which are coupled to the rotatable shaft 540. The interaction between the cams 541a, 541b and knockdown device 900 may be similar to a see-saw mechanism. As illustrated in FIG. 12, an upper side of the cams 541a, 541b may contact a lower side of tab 906a, 906b of the knockdown device 900. When the cams 541a, 541b are rotated in a counter-clockwise direction, the tabs 906a, 906b are moved upward and the opposite side of the knockdown device 900 which includes the body 901 and arms 902a, 902b is moved downward. As illustrated in FIGS. 13 and 14, the cams 541a, 541b may be interlocked with tabs 906a, 906b of the knockdown device 900, according to an example. However, as illustrated in FIG. 12, the cams 541a, 541b may be located near or about the tabs 906a, 906b of the knockdown device 900 without being interlocked, according to an example.

[0045] FIGS. 13 and 14 are views illustrating the rotatable shaft 540 and cams 541a, 541b from a rear side of the upper paper guide 570. As shown in FIG. 14, a one-way clutch 542 may be coupled to the rotatable shaft 540 to control rotation of a corresponding cam such that the cams rotate in one direction but do not rotate in the other direction. For example, a one-way clutch 542 may be provided for each of the cams 541a, 541b. A one-way clutch 542 may be incorporated for each cam 541a, 541b on the rotatable shaft 540 such that when the rotatable shaft 540 and paddles 531 rotate in the forward direction to pull the recording medium back toward the end portion 521 of the register tray 520, the cams 541a, 541b do not rotate, and when the rotatable shaft 540 and paddles 531 rotate in the reverse direction, the cams 541a, 541b are rotated via the corresponding one-way clutch 542 to actuate the tabs 906a, 906b of the knockdown device 900 and cause the knockdown device 900 to rotate downward and contact the recording medium to apply a downward force to the recording medium. According to another example, the one-way clutch 542 may instead be a friction clutch.

[0046] An operation of the knockdown device 900 will now be described according to an example. When the recording medium drops down from the exit rollers 457 to the register tray 520 the pusher bar 550 may rotate to push downward against a trailing edge of the recording medium to assist the recording medium in dropping down to the register tray 520. When the recording medium is located on the register tray 520 the rotatable shaft 540 and paddles 531 may rotate in the forward direction. The rotatable shaft 540 and paddles 531 may rotate in the forward direction once or a plurality of times. For example, during the compiling of the recording medium, the controller 410 may transmit a signal to the driving source 430 to control the driving source 430 to rotate the rotat-

able shaft 540 in the forward direction a predetermined number of times. The driving source 430 may be a motor, for example. The signal or command indicates to the driving source 430 the number of times the rotatable shaft 540 is to be rotated by the driving source 430 in the forward direction during a compiling operation with respect to the recording medium. A number of rotations of the rotatable shaft 540 in the forward direction for compiling a recording medium can vary. For example, the controller 410 can determine the number of rotations of the rotatable shaft 540 in the forward direction based on information regarding the recording medium, information regarding the finishing operation, or combinations thereof.

[0047] Information regarding the recording medium and finishing operation may be obtained from the printer 100, the finisher 400 itself, from another source, or combinations thereof. As an example, when a job is received at the printer 100, the printer 100 may communicate with the finisher 400 by transmitting a signal including job information to the finisher 400 that identifies, or is indicative of, various characteristics pertaining to the job. For example, the job information may include a number of recording media to be compiled, a type of recording medium, a thickness of the recording medium, an ink content on the recording medium, or combinations thereof. The job information may be in the form of a code. The controller 410 of the finisher 400 can interpret the job information received from the printer 100, for example by interpreting the code, to obtain the job information. The controller 410 can store the job information in the machine readable storage 420.

[0048] According to an example, because the one-way clutch 542 prevents rotation of the cams 541a, 541b during forward rotation of the rotatable shaft 540, the cams 541a, 541b do not rotate, and the knockdown device 900 is not rotated, when the rotatable shaft 540 is rotated in the forward direction.

[0049] After completion of the forward rotation of the rotatable shaft 540 and paddles 531, the rotatable shaft 540 may be rotated in a reverse direction. For example, the controller 410 may transmit a signal to the driving source 430 to control the driving source 430 to rotate the rotatable shaft 540 in the reverse direction a predetermined number of times. According to an example, because the one-way clutch 542 permits rotation of the cams 541a, 541b during reverse rotation of the rotatable shaft 540, the cams 541a, 541b rotate and the knockdown device 900 is rotated downward to contact the recording medium. For example, the knockdown device 900 may contact the leading edge or front portion of the recording medium. The cams 541a, 541b are rotated a same number of times the rotatable shaft 540 is rotated in the reverse direction. The knockdown device 900 performs the knockdown action a same number of times the rotatable shaft 540 is rotated in the reverse direction. The number of reverse rotations of the rotatable shaft 540 may be once or a plurality of times. The number of reverse rotations of the rotatable shaft 540 may be less than the

number of times the rotatable shaft 540 and paddles 531 are rotated in the forward direction for paddling the recording medium. As another example, the controller 410 may determine no reverse rotation of the rotatable shaft 540 is to be performed. For example, the controller 410 may determine, based on a type of recording medium for example, that the recording medium is unlikely to have a curl and therefore the knockdown is not performed by the knockdown device 900.

[0050] Actuation of the knockdown device 900 is based on the rotation of the rotatable shaft 540 to drive the motion of the knockdown device 900, for example. The cams 541a, 541b are coupled to the rotatable shaft 540 through a one-way clutch or friction clutch so as to control the timing of the knockdown actuation. The knockdown device 900 can be activated such that rotation of the rotatable shaft 540 in the reverse direction causes the knockdown device 900 to lower once per cycle. According to this operation, actuation of the knockdown device 900 is performed independent of a number of forward paddles performed to compile media. As another example, rotation of the knockdown device 900 may be based on the rotation of the rotatable knockdown shafts 904a, 904b, which may be combined as a single shaft, to drive the motion of the knockdown device 900. That is, a driving source, other than a driving source used to drive rotatable shaft 540, may be provided to drive rotation of the rotatable knockdown shaft and the knockdown device 900.

[0051] The knockdown device 900 is rotated to contact the recording medium and may be immediately rotated back upwards to the upper position to be stored in the recess 573 of the upper paper guide 570. The knockdown device 900 may be lowered for a duration long enough to contact the recording medium and eliminate or reduce the curl in the recording medium, while also not delaying completion of the compiling and finishing operations unnecessarily. Also, because the knockdown actuation occurs during a reverse rotation of the rotatable shaft 540, interference between the knockdown device 900 and operation of the tamper 560 and paddles 531 may be avoided.

[0052] FIG. 15 is a perspective view of a knockdown device 900' in an upper position and coupled to the upper paper guide 570' of the compiler 500, according to an example. FIG. 16 is a side view of the knockdown device 900', according to an example. FIGS. 17A and 17B are side views of the knockdown device 900' in the upper position and a lower position, respectively, according to an example. The knockdown device 900' includes a body 901' that is elongated in a direction perpendicular to a rotation axis of the rotatable shaft 540. A length of the body 901' may be chosen in consideration of a range of widths of recording mediums that may be processed by the finisher 400 balanced with avoiding contacting with the tamper 560 during the compiling operation, for example. As shown in FIGS. 15 and 16, one end of each of the arms 902a', 902b' extends from the body 901' and the other end of each of the arms 902a', 902b' is coupled

to the upper paper guide 570'.

[0053] The knockdown device 900' is mounted to the upper paper guide 570'. For example, each arm 902a', 902b' is coupled to the upper paper guide 570' by a rotatable knockdown shaft 904a', 904b' that is formed as a protrusion or pin which protrudes from an outer side of each of the arms 902a', 902b'. The rotatable knockdown shafts 904a', 904b' are inserted into a respective groove or pinhole 572' that is formed in a portion of the upper paper guide 570'. The knockdown device 900' is rotatable about the rotatable knockdown shafts 904a', 904b', such that a rotation axis of the knockdown device 900' is parallel to and offset from a rotation axis of the rotatable shaft 540. As can be seen from FIG. 16, the rotation axis of the knockdown device 900' is on an opposite side of the rotatable shaft compared to the rotation axis of the knockdown device 900 in FIG. 12.

[0054] The upper paper guide 570' may include a cut-out or recess 573' formed therein to accommodate the arms 902a', 902b', and body 901' of the knockdown device 900' when the knockdown device 900' is in an upper position. The ability to store the knockdown device 900' in the recess 573' while the knockdown device 900' is not being utilized allows the knockdown device 900' to avoid contact with a recording medium being compiled as well as recording media stacked in the register tray 520. Also, a sound-dampening material may be provided in the recess 573' so that when the knockdown device 900' returns to the upper position, a noise may be reduced or minimized. A sound-dampening material can also be provided on an upper side of the knockdown device 900'.

[0055] A plurality of ribs 903' are formed on a lower surface of the knockdown device 900'. The ribs 903' protrude from the lower surface of the knockdown device 900' such that when the knockdown device 900' contacts the recording medium a surface area of the knockdown device 900' that contacts the recording medium is less than a surface area of the knockdown device 900' that contacts the recording medium when no ribs are provided. Therefore, a noise level caused by the knockdown device 900' striking the recording medium can be reduced. The knockdown device 900' may be made of plastic, for example.

[0056] The knockdown device 900' may include surfaces which are chamfered, curbed, or angled in such a way to reduce a noise associated with rotating the knockdown in an upward and downward motion. For example, the body 901', arms 902a', 902b', ribs 903', or a combination thereof, may have curved surfaces.

[0057] As shown in FIGS. 15 through 17B, the end of the arms 902a', 902b' connected to the upper paper guide 570' may have various shapes. For example, the end of the arms 902a', 902b' connected to the upper paper guide 570' may have a closed rectangular or box shaped handle, an L-shaped handle, or a U-shape handle. In each of the examples of FIGS. 15 through 17B, cams 541a', 541b' are disposed at an inner side of the handles, such

that an upper surface of the cams 541a', 541b' is in contact with an inner side surface of the corresponding handle.

[0058] FIGS. 17A and 17B are side views of the knockdown device 900' in the upper position and a lower position, respectively, according to an example. FIGS. 17A and 17B show cam 541a' in contact with inner side surface 909' of handle 908' provided at the end of arm 902a' of the knockdown device 900', according to an example. The knockdown device 900' can be rotated by rotation of the cams 541a', 541b' which are coupled to the rotatable shaft 540. As illustrated in FIG. 17A, when the cam 541a' is in an upper position, the knockdown device 900' is in an upper position. As illustrated in FIG. 17B, when the cam 541a' rotates to a lower position, due to a force applied by the cam 541a' to the inner side of the handle 908', the knockdown device 900' rotates downward to contact the recording medium. The cam 541a' completes its rotation to return to the highest position and the knockdown device 900' returns to the upper position.

[0059] An operation of the knockdown device 900' will now be described according to an example. When the recording medium is located on the register tray 520 the rotatable shaft 540 and paddles 531 may rotate in the forward direction. The rotatable shaft 540 and paddles 531 may rotate in the forward direction once or a plurality of times. The number of forward rotations may depend on a type of recording medium, an amount of ink on the recording medium, or a combination thereof, for example. For example, during the compiling of the recording medium, the controller 410 may transmit a signal to the driving source 430 to control the driving source 430 to rotate the rotatable shaft 540 in the forward direction a predetermined number of times.

[0060] The cams 541a', 541b' rotate together with rotation of the rotatable shaft 540. Therefore, the cams 541a', 541b' rotate a same number of times that the rotatable shaft 540 is rotated and a same number of times that the paddles rotate. Furthermore, because the knockdown device 900' is actuated when the cams 541a', 541b' rotate, the knockdown device 900' performs the knockdown of the recording medium a same number of times that the rotatable shaft 540 rotates. For example, if the paddles are rotated in the forward direction two times to compile a recording medium, the knockdown device 900' is actuated two times by the cams 541a', 541b' such that the knockdown device 900' is rotated and two knockdowns of the recording medium are performed. Likewise, if the paddles are rotated in the forward direction four times to compile a recording medium, four knockdowns of the recording medium are performed. For example, the knockdown device 900' may contact the leading edge or front portion of the recording medium.

[0061] As another example, the controller 410 may determine no forward rotation of the rotatable shaft 540 is to be performed. For example, the controller 410 may determine, based on a type of recording medium for example, that the recording medium is unlikely to have a

curl and therefore paddling by the paddles 531 and a knockdown by the knockdown device 900' is not performed.

[0062] Actuation of the knockdown device 900' is based on the rotation of the rotatable shaft 540 to drive the motion of the knockdown device 900'. The cams 541a', 541b' are coupled to the rotatable shaft 540 so as to control the timing of the knockdown actuation. The knockdown device 900' can be activated such that rotation of the rotatable shaft 540 in the forward direction causes the knockdown device 900' to rotate downward to apply a force to the recording medium once per cycle or once each rotation of the rotatable shaft 540. According to this operation, actuation of the knockdown device 900' is dependent upon the number of forward paddles performed to compile media. For example, a number of times the knockdown device 900' is actuated and the number of forward paddles performed to compile media may be the same such that there is a 1 to 1 relationship between the number of times the knockdown device 900' is actuated and the number of forward paddles performed to compile media.

[0063] As another example, rotation of the knockdown device 900' in the forward direction may be based on the rotation of the rotatable knockdown shafts 904a', 904b', which may be combined as a single shaft, to drive the motion of the knockdown device 900'. That is, a driving source, other than a driving source used to drive rotatable shaft 540, may be provided to drive rotation of the rotatable knockdown shaft and the knockdown device 900'.

[0064] The knockdown device 900' is rotated to contact the recording medium and may be immediately rotated back upwards to the upper position to be stored in the recess 573' of the upper paper guide 570'. The knockdown device 900' may be lowered for a duration long enough to contact the recording medium and eliminate or reduce the curl in the recording medium, while also not delaying completion of the compiling and finishing operations unnecessarily. For example, for compiling of a recording medium during a single rotation of the rotatable shaft 540, the knockdown device 900' may be in contact with the recording medium for a duration less than a duration that the paddles 531 are in contact with the recording medium. Minimizing or reducing a duration that the knockdown device 900' is lowered also reduces a risk of the knockdown device 900' interfering with operation of the tamper 560 and paddles 531 during compiling.

[0065] FIG. 18 is a perspective view of a knockdown device 900" in an upper position and coupled to the upper paper guide 570" of the compiler 500, according to an example. The knockdown device 900" differs from the knockdown device 900' in that the two arms are not joined together by a common body, resulting in two L-shaped knockdowns. As shown in FIG. 18, the knockdown device 900" includes a first body 901a" and a second body 901b" that are each elongated in a direction perpendicular to a rotation axis of the rotatable shaft 540. A length of the

first body 901a" and the second body 901b" and a distance that the first body 901a" and the second body 901b" are spaced apart from one another may be chosen in consideration of a range of widths of recording mediums that may be processed by the finisher 400 balanced with avoiding contacting with the tamper 560 during the compiling operation, for example. One end of first arm 902a" extends from the first body 901" and the other end of first arm 902a" is coupled to the upper paper guide 570". Likewise, one end of second arm 902b" extends from the second body 901" and the other end of second arm 902b" is coupled to the upper paper guide 570".

[0066] The knockdown device 900" may be mounted to the upper paper guide 570" in a manner similar to that described above with respect to knockdown device 900'. That is, except for the fact that arms 902a", 902b" are not joined together by a common body in contrast to the knockdown device 900', the knockdown device 900" may be considered to be similar in construction and operation in all other respects compared to knockdown device 900' and therefore a detailed description thereof will not be repeated. However, because arms 902a', 902b' of knockdown device 900' are joined together by the common body 903', the arms 902a', 902b' of knockdown device 900' may experience less torsion or twisting compared to the arms 902a", 902b" of knockdown device 900" during rotation.

[0067] After the knockdown device completes the knockdown action on the recording medium, and the recording media have been compiled in the register tray 520, a finishing process can be performed on the recording media and the finished recording media can be discharged or ejected from the compiler 500 to the lower output bin 456 for retrieval by a user. For example, the stapler 510 (see FIG. 3A) can perform a stapling operation on the recording media when the recording media has been compiled. The stapled recording media can be ejected or discharged from the compiler 500 to the lower output bin 456. For example, the stack of finished recording media can be ejected or discharged from the compiler 500 using a clamp that clamps an edge of the stack of finished recording media, ejector arms, a conveying belt 580 (see FIG. 5), and wheel 590 (see FIG. 5) that transport the stack of finished recording media out to the lower output bin 456.

[0068] As discussed above, various knockdown devices for a finisher may be implemented to knock down a recording medium during a compiling process of the recording medium so as to flatten the recording medium and eliminate or decrease a curl in the recording medium. Reduction of the curl can improve a job quality of compiled media stacks, enable increased temperatures to be utilized in the image forming apparatus to remove moisture from a recording medium, and increase a stack capacity of the compiler in the finisher.

[0069] Executable instructions to perform processes or operations in accordance with the above-described examples may be recorded in a machine readable stor-

age. A controller may execute the executable instructions to perform the processes or operations. Examples of instructions include both machine code, such as that produced by a compiler, and files containing higher level code that may be executed by the controller using an interpreter. The instructions may be executed by a processor or a plurality of processors included in the controller. The machine readable storage may be distributed among computer systems connected through a network and computer-readable codes or instructions may be stored and executed in a decentralized manner.

[0070] The disclosure can be readily applied to other types of apparatuses. Also, the description of the examples of the disclosure is intended to be illustrative, and not to limit the scope of the invention, which is defined by the appended claims.

Claims

1. A knockdown apparatus for a finisher (400), comprising:

a register tray (520);
 a paddle (530, 531) coupled to a rotatable shaft (540) to compile a recording medium toward an end of the register tray (520);
 a knockdown device (800, 900, 900', 900''), provided above the register tray, to rotate to apply a downward force to the recording medium while the recording medium is in the register tray to decrease a curl in the recording medium; and
 an upper paper guide (570, 570', 570'') provided above the register tray, **characterized in that** the knockdown device includes:

a first end coupled to the upper paper guide such that the knockdown device rotates about the first end, and
 a second end including at least one of a roller wheel (810) or a rib (903, 903'), and
 the at least one of the roller wheel (810) or the rib (903, 903') is to contact the recording medium to apply the downward force to the recording medium when the knockdown device rotates.

2. The knockdown apparatus of claim 1, wherein said second end includes ribs (903, 903'), and wherein a rotation axis of the knockdown device (800, 900, 900', 900'') is parallel to and offset from a rotation axis of the rotatable shaft (540).
3. The knockdown apparatus of claim 1, wherein the knockdown device (800, 900, 900', 900'') is to contact a leading edge of the recording medium to apply the downward force to the recording medium while the recording medium is in the register tray (520).

4. The knockdown apparatus of claim 1, wherein said second end includes ribs (903, 903'), and wherein the knockdown device (900, 900', 900'') includes:

a body (901, 901', 901a'') elongated in an outward direction perpendicular to a rotation axis of the rotatable shaft (540),
 a first end of the body coupled to a portion of the upper paper guide (570, 570', 570'') such that the knockdown device rotates about the first end, and
 a second end of the body to, when the knockdown device rotates, contact the recording medium to apply the downward force to the recording medium.

5. The knockdown apparatus of claim 1, further comprising:

a cam (541a, 541a') coupled to the rotatable shaft (540),
 wherein said second end includes ribs (903, 903'), and wherein the knockdown device (900, 900', 900'') includes:

a body (901, 901', 901a''), elongated in a direction parallel to a rotation axis of the rotatable shaft (540), to contact the recording medium and apply the downward force to the recording medium when the knockdown device rotates, and
 an arm (902a, 902a', 902a'') having a first end coupled to the body (901, 901', 901a'') and a second end to contact the cam (541a, 541a') such that when the cam rotates the knockdown device (900, 900', 900'') rotates.

6. The knockdown apparatus of claim 5, further comprising:

a clutch (542) to prevent rotation of the cam (541a) in a first direction when the rotatable shaft (540) rotates in the first direction and to permit rotation of the cam (541a) in a second direction when the rotatable shaft (540) rotates in the second direction,
 wherein the paddle (530, 531) is to rotate in the first direction to compile the recording medium when the rotatable shaft (540) rotates in the first direction.

7. The knockdown apparatus of claim 6, wherein

the paddle (530, 531) is to rotate in the first direction to compile the recording medium together with rotation of the rotatable shaft (540) in the first direction,

the cam (541a) is to rotate in the first direction together with rotation of the rotatable shaft (540) in the first direction, and rotation of the cam (541a) in the first direction causes the knockdown device (900, 900', 900'') to rotate in the first direction such that the body (901, 901', 901a'') contacts the recording medium to apply the downward force to the recording medium.

8. The knockdown apparatus of claim 7, wherein a duration that the paddle (530, 531) contacts the recording medium to compile the recording medium toward the end of the register tray (520) is greater than a duration that the body (901, 901', 901a'') contacts the recording medium to apply the downward force to the recording medium.

Patentansprüche

1. Niederhalteeinrichtung für ein Fertigstellungsgerät (400), die Folgendes umfasst:

ein Registerfach (520);
 ein Paddel (530, 531), das mit einer drehbaren Welle (540) gekoppelt ist, um ein Aufzeichnungsmedium in Richtung eines Endes des Registerfachs (520) zu sammeln;
 eine Niederhaltevorrichtung (800, 900, 900', 900''), die über dem Registerfach bereitgestellt ist, um sich zu drehen, um eine nach unten gerichtete Kraft auf das Aufzeichnungsmedium auszuüben, während sich das Aufzeichnungsmedium in dem Registerfach befindet, um eine Krümmung des Aufzeichnungsmediums zu verringern; und
 eine obere Papierführung (570, 570', 570''), die über dem Registerfach bereitgestellt ist, **dadurch gekennzeichnet, dass** die Niederhaltevorrichtung Folgendes einschließt:

ein erstes Ende, das mit der oberen Papierführung derart gekoppelt ist, dass sich die Niederhaltevorrichtung um das erste Ende dreht, und
 ein zweites Ende einschließlich mindestens eines von einem Rollenrad (810) oder einer Rippe (903, 903'), und
 wobei das mindestens eine des Rollenrads (810) und/oder der Rippe (903, 903') dazu dient, das Aufzeichnungsmedium zu berühren, um die nach unten gerichtete Kraft auf das Aufzeichnungsmedium auszuüben, wenn sich die Niederhaltevorrichtung dreht.

2. Niederhalteeinrichtung nach Anspruch 1, wobei das zweite Ende Rippen (903, 903') einschließt und wo-

bei eine Drehachse der Niederhaltevorrichtung (800, 900, 900', 900'') parallel zu einer Drehachse der drehbaren Welle (540) und von dieser versetzt ist.

3. Niederhalteeinrichtung nach Anspruch 1, wobei die Niederhaltevorrichtung (800, 900, 900', 900'') dazu dient, eine Vorderkante des Aufzeichnungsmediums zu berühren, um die nach unten gerichtete Kraft auf das Aufzeichnungsmedium auszuüben, während sich das Aufzeichnungsmedium in dem Registerfach (520) befindet.

4. Niederhalteeinrichtung nach Anspruch 1, wobei das zweite Ende Rippen (903, 903') einschließt, und wobei die Niederhaltevorrichtung (900, 900', 900'') einschließt:

einen Körper (901, 901', 901a''), der in einer nach außen gerichteten Richtung senkrecht zu einer Drehachse der drehbaren Welle (540) länglich ist,

ein erstes Ende des Körpers, das mit einem Abschnitt der oberen Papierführung (570, 570', 570'') derart gekoppelt ist, dass sich die Niederhaltevorrichtung um das erste Ende dreht, und ein zweites Ende des Körpers, um, wenn sich die Niederhaltevorrichtung dreht, das Aufzeichnungsmedium zu berühren, um die nach unten gerichtete Kraft auf das Aufzeichnungsmedium auszuüben.

5. Niederhalteeinrichtung nach Anspruch 1, die ferner Folgendes umfasst:

eine Nocke (541a, 541a'), die mit der drehbaren Welle (540) gekoppelt ist, wobei das zweite Ende Rippen (903, 903') einschließt, und wobei die Niederhaltevorrichtung (900, 900', 900'') Folgendes einschließt:

einen Körper (901, 901', 901a''), der in einer Richtung parallel zu einer Drehachse der drehbaren Welle (540) länglich ist, um das Aufzeichnungsmedium zu berühren und die nach unten gerichtete Kraft auf das Aufzeichnungsmedium auszuüben, wenn sich die Niederhaltevorrichtung dreht, und einen Arm (902a, 902a', 902a''), der ein erstes Ende, das mit dem Körper (901, 901', 901a'') gekoppelt ist, und ein zweites Ende, um die Nocke (541a, 541a') zu berühren, derart aufweist, dass sich die Niederhaltevorrichtung (900, 900', 900'') dreht, wenn sich die Nocke dreht.

6. Niederhalteeinrichtung nach Anspruch 5, die ferner Folgendes umfasst:

eine Kupplung (542), um eine Drehung der Nocke (541a) in eine erste Richtung zu verhindern, wenn sich die drehbare Welle (540) in die erste Richtung dreht, und um eine Drehung der Nocke (541a) in eine zweite Richtung zuzulassen, wenn sich die drehbare Welle (540) in die zweite Richtung dreht, wobei das Paddel (530, 531) dazu dient, sich in die erste Richtung zu drehen, um das Aufzeichnungsmedium zu sammeln, wenn sich die drehbare Welle (540) in die erste Richtung dreht.

7. Niederhalteeinrichtung nach Anspruch 6, wobei

das Paddel (530, 531) dazu dient, sich in die erste Richtung zu drehen, um das Aufzeichnungsmedium zu sammeln, zusammen mit einer Drehung der drehbaren Welle (540) in die erste Richtung, die Nocke (541a) dazu dient, sich in die erste Richtung zu drehen, zusammen mit einer Drehung der drehbaren Welle (540) in die erste Richtung, und eine Drehung der Nocke (541a) in die erste Richtung die Niederhaltevorrichtung (900, 900', 900'') veranlasst, sich derart in die erste Richtung zu drehen, dass der Körper (901, 901', 901a'') das Aufzeichnungsmedium berührt, um die nach unten gerichtete Kraft auf das Aufzeichnungsmedium auszuüben.

8. Niederhaltevorrichtung nach Anspruch 7, wobei die Dauer, in der das Paddel (530, 531) das Aufzeichnungsmedium berührt, um das Aufzeichnungsmedium in Richtung des Endes des Registerfachs (520) zu sammeln, größer als die Dauer, in der der Körper (901, 901', 901a'') das Aufzeichnungsmedium berührt, um die nach unten gerichtete Kraft auf das Aufzeichnungsmedium auszuüben, ist.

Revendications

1. Appareil de frappe pour un dispositif de finition (400), comprenant :

un bac de repérage (520) ;
une palette (530, 531) accouplée à un arbre rotatif (540) pour compiler un support d'enregistrement vers une extrémité du bac de repérage (520) ;
un dispositif de frappe (800, 900, 900', 900''), prévu au-dessus du bac de repérage, pour tourner pour appliquer une force vers le bas au support d'enregistrement pendant que le support d'enregistrement est dans le bac de repérage pour diminuer une courbure dans le support d'enregistrement ; et

un guide papier supérieur (570, 570', 570'') prévu au-dessus du bac de repérage,
caractérisé en ce que le dispositif de frappe comporte :

une première extrémité accouplée au guide papier supérieur de telle sorte que le dispositif de frappe tourne autour de la première extrémité, et
une seconde extrémité comportant au moins l'un parmi un galet de roulement (810) ou une nervure (903, 903'), et
l'au moins un parmi le galet de roulement (810) ou la nervure (903, 903') doit entrer en contact avec le support d'enregistrement pour appliquer la force vers le bas au support d'enregistrement lorsque le dispositif de frappe tourne.

2. Appareil de frappe selon la revendication 1, dans lequel ladite seconde extrémité comporte des nervures (903, 903'), et dans lequel un axe de rotation du dispositif de frappe (800, 900, 900', 900'') est parallèle à un axe de rotation de l'arbre rotatif (540) et décalé par rapport à celui-ci.

3. Appareil de frappe selon la revendication 1, dans lequel le dispositif de frappe (800, 900, 900', 900'') doit entrer en contact avec un bord avant du support d'enregistrement pour appliquer la force vers le bas au support d'enregistrement pendant que le support d'enregistrement est dans le bac de repérage (520).

4. Appareil de frappe selon la revendication 1, dans lequel ladite seconde extrémité comporte des nervures (903, 903'), et dans lequel le dispositif de frappe (900, 900', 900'') comporte :

un corps (901, 901', 901a'') allongé dans une direction vers l'extérieur perpendiculaire à un axe de rotation de l'arbre rotatif (540),
une première extrémité du corps accouplée à une partie du guide papier supérieur (570, 570', 570'') de telle sorte que le dispositif de frappe tourne autour de la première extrémité, et
une seconde extrémité du corps pour, lorsque le dispositif de frappe tourne, entrer en contact avec le support d'enregistrement pour appliquer la force vers le bas au support d'enregistrement.

5. Appareil de frappe selon la revendication 1, comprenant en outre :

une came (541a, 541a') accouplée à l'arbre rotatif (540),
dans lequel ladite seconde extrémité comporte des nervures (903, 903'), et dans lequel le dis-

positif de frappe (900, 900', 900") comporte :

un corps (901, 901', 901a"), allongé dans une direction parallèle à un axe de rotation de l'arbre rotatif (540), pour entrer en contact avec le support d'enregistrement et appliquer la force vers le bas au support d'enregistrement lorsque le dispositif de frappe tourne, et
un bras (902a, 902a', 902a") ayant une première extrémité accouplée au corps (901, 901', 901a") et une seconde extrémité pour entrer en contact avec la came (541a, 541a') de telle sorte que lorsque la came tourne, le dispositif de frappe (900, 900', 900") tourne.

6. Appareil de frappe selon la revendication 5, comprenant en outre :

un embrayage (542) pour empêcher la rotation de la came (541a) dans un premier sens lorsque l'arbre rotatif (540) tourne dans le premier sens et pour permettre la rotation de la came (541a) dans un second sens lorsque l'arbre rotatif (540) tourne dans le second sens, dans lequel la palette (530, 531) doit tourner dans le premier sens pour compiler le support d'enregistrement lorsque l'arbre rotatif (540) tourne dans le premier sens.

7. Appareil de frappe selon la revendication 6, dans lequel

la palette (530, 531) doit tourner dans le premier sens pour compiler le support d'enregistrement avec la rotation de l'arbre rotatif (540) dans le premier sens, la came (541a) doit tourner dans le premier sens conjointement avec la rotation de l'arbre rotatif (540) dans le premier sens, et la rotation de la came (541a) dans le premier sens amène le dispositif de frappe (900, 900', 900") à tourner dans le premier sens de telle sorte que le corps (901, 901', 901a") entre en contact avec le support d'enregistrement pour appliquer la force vers le bas au support d'enregistrement.

8. Appareil de frappe selon la revendication 7, dans lequel une durée pendant laquelle la palette (530, 531) entre en contact avec le support d'enregistrement pour compiler le support d'enregistrement vers l'extrémité du bac de repérage (520) est supérieure à une durée pendant laquelle le corps (901, 901', 901a") entre en contact avec le support d'enregistrement pour appliquer la force vers le bas au support d'enregistrement.

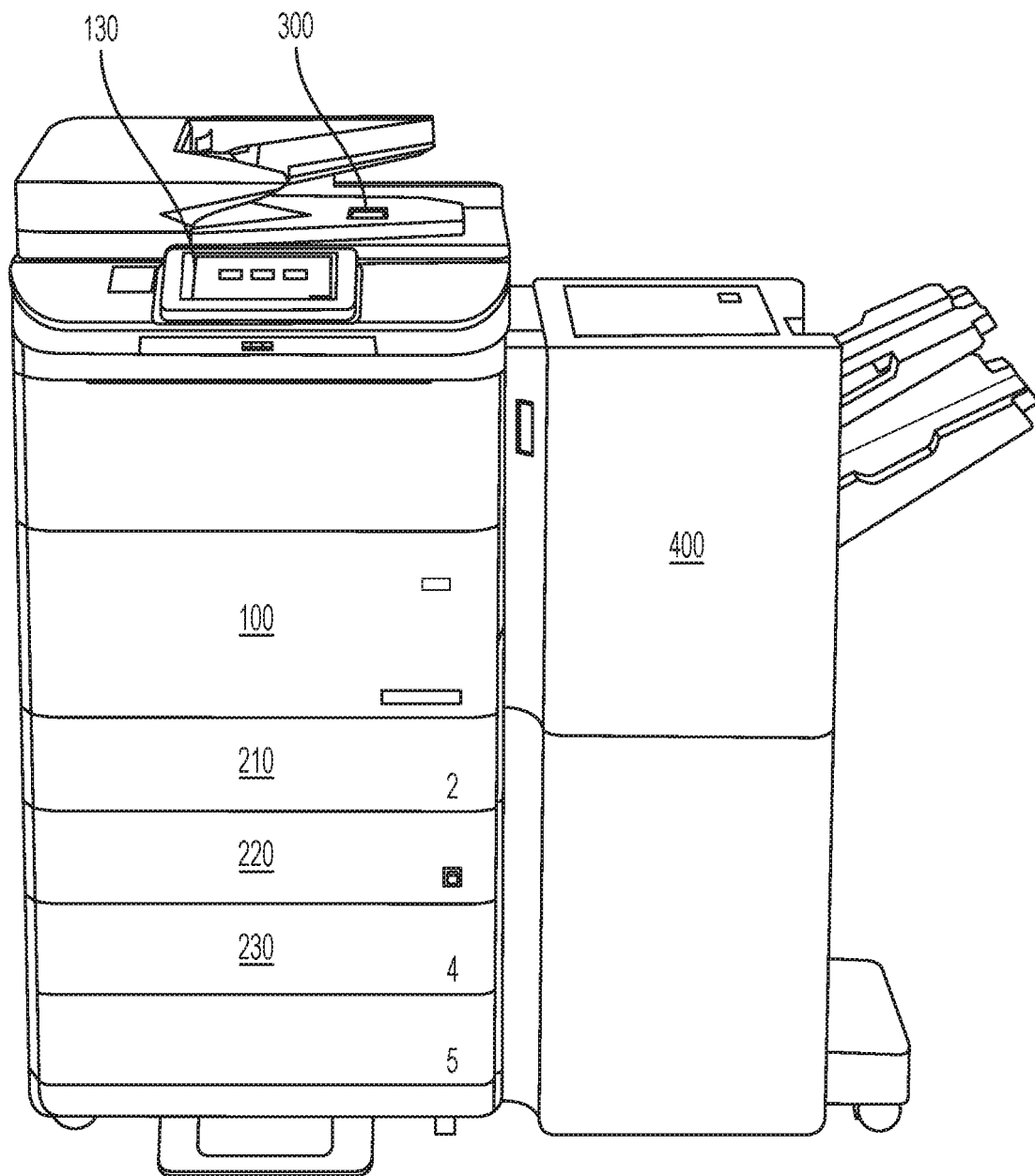


FIG. 1

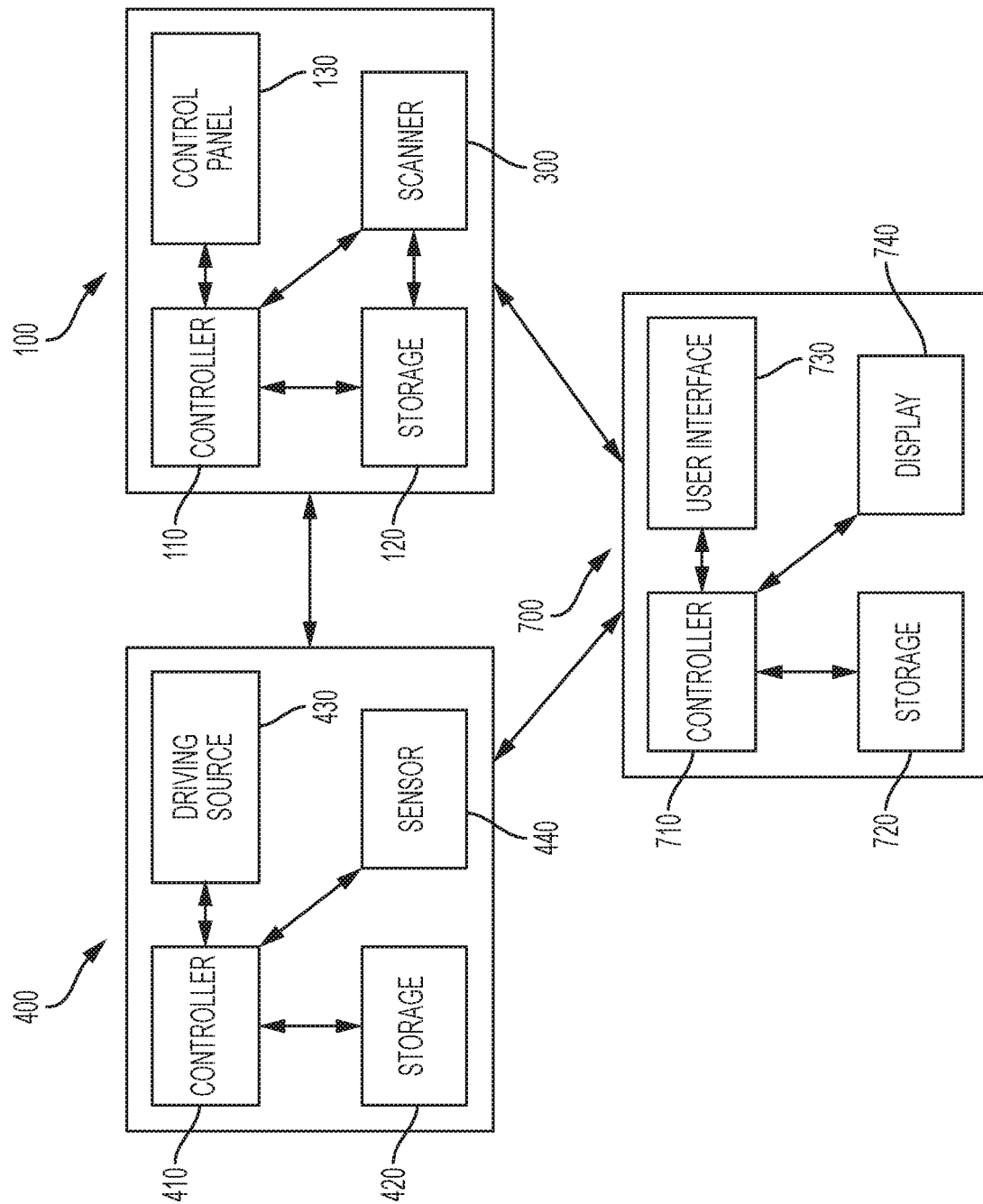


FIG. 2

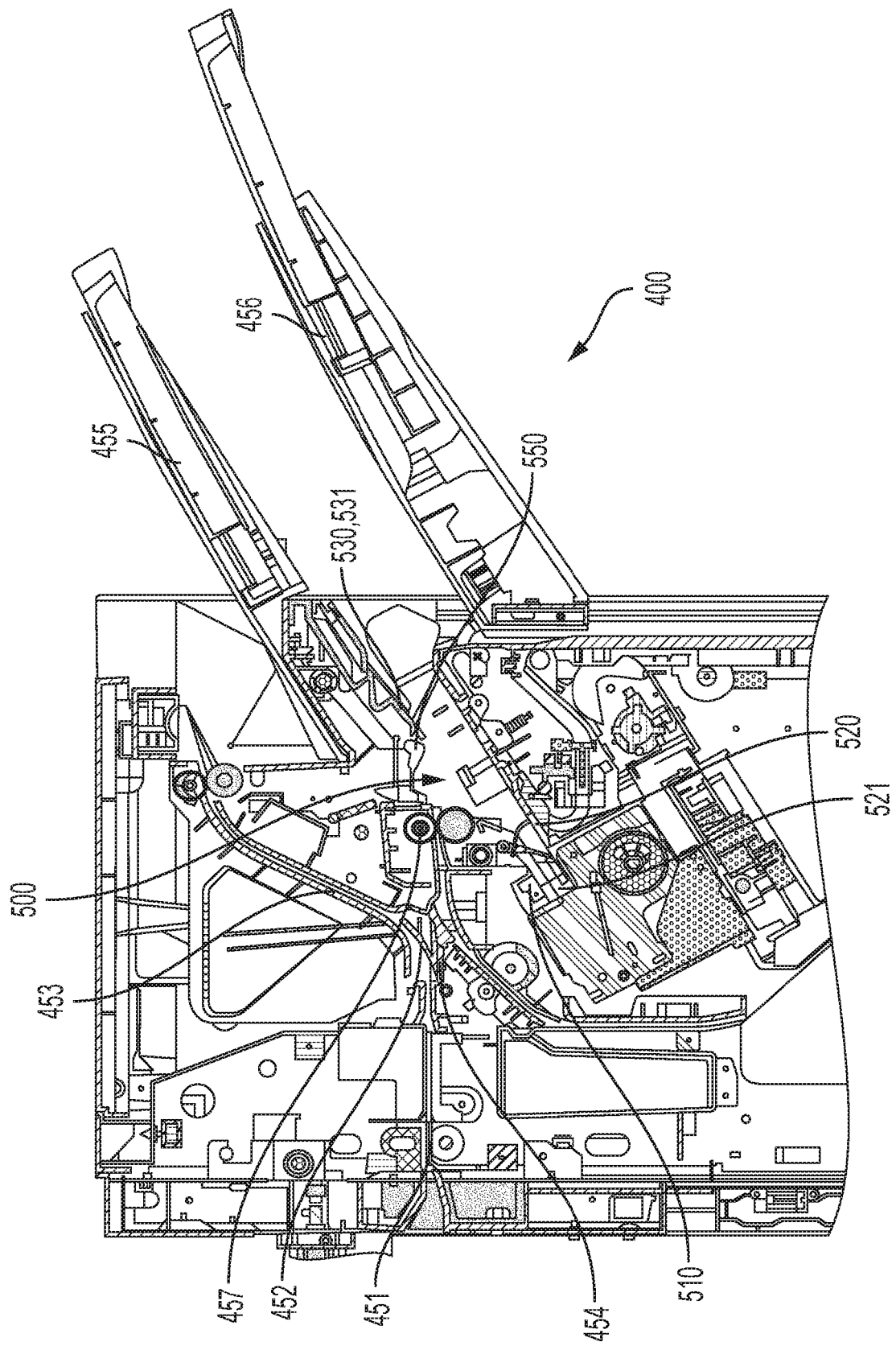


FIG. 3A

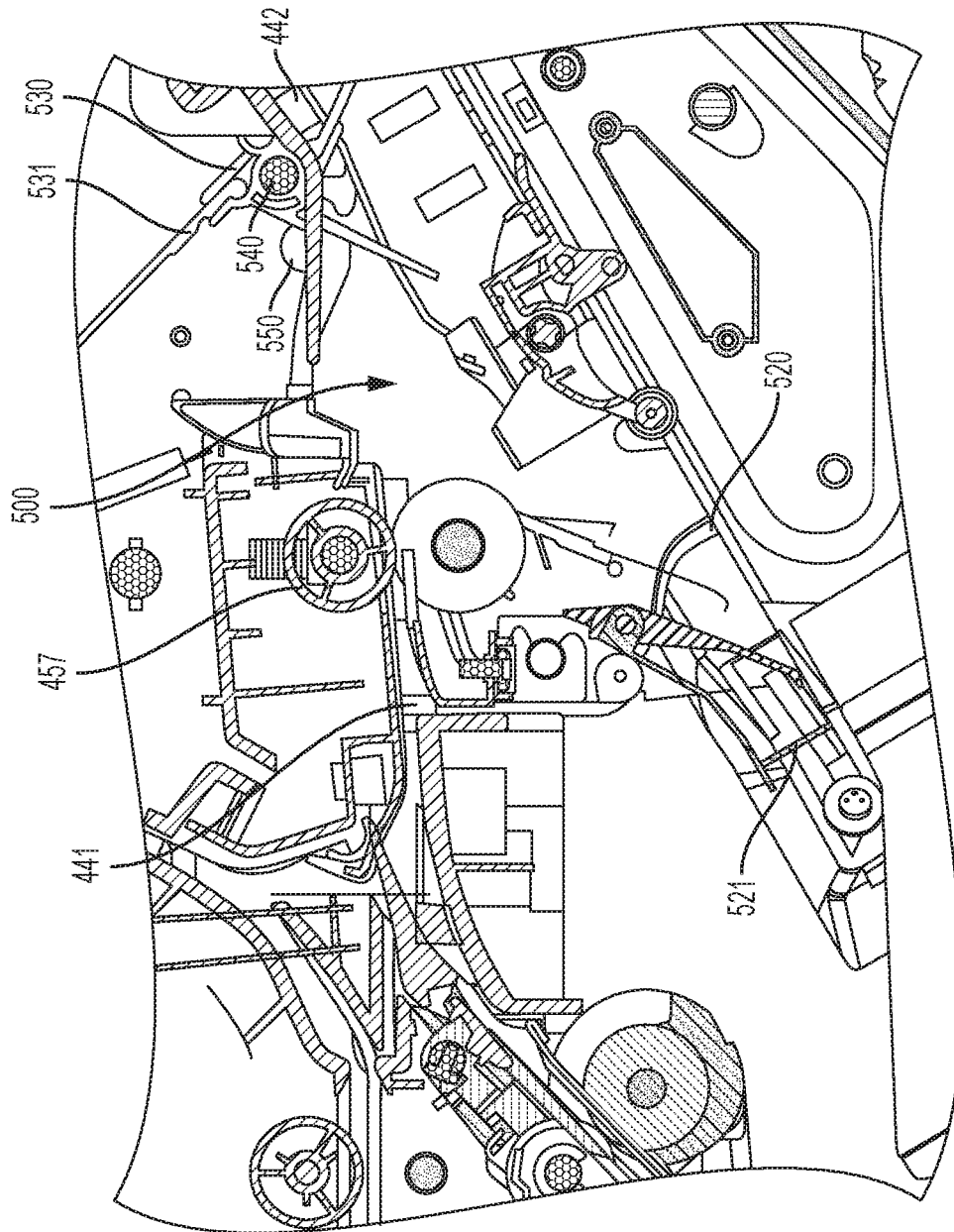


FIG. 3B

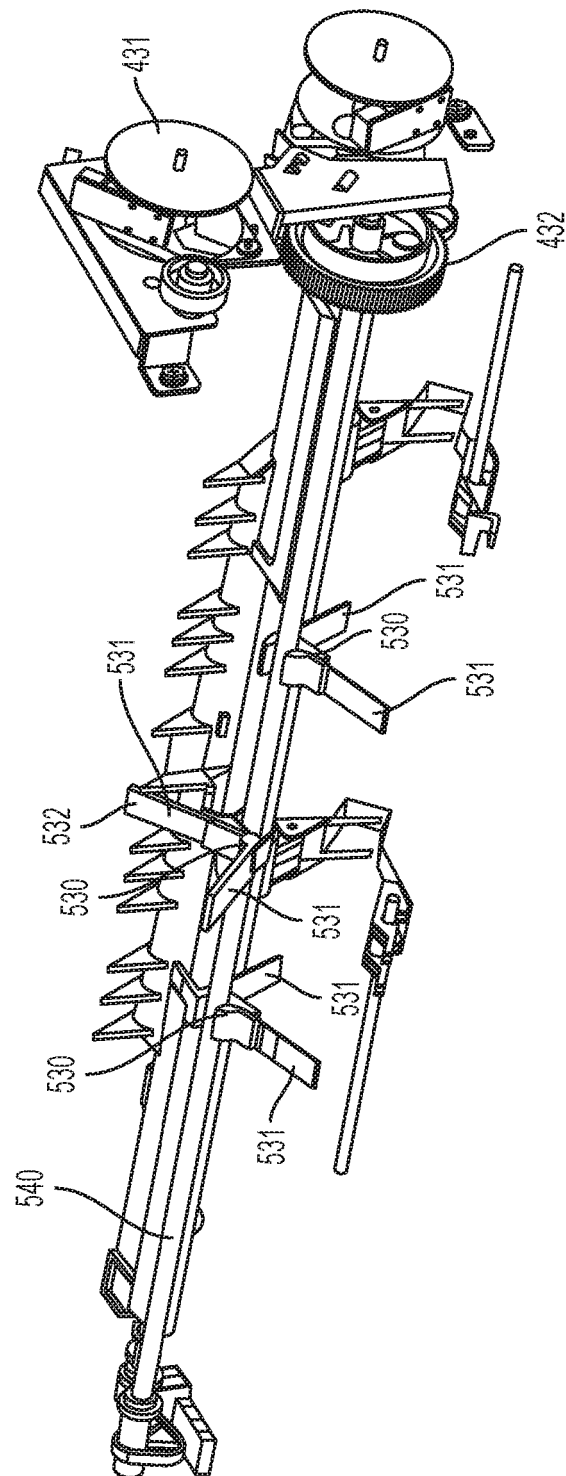


FIG. 4A

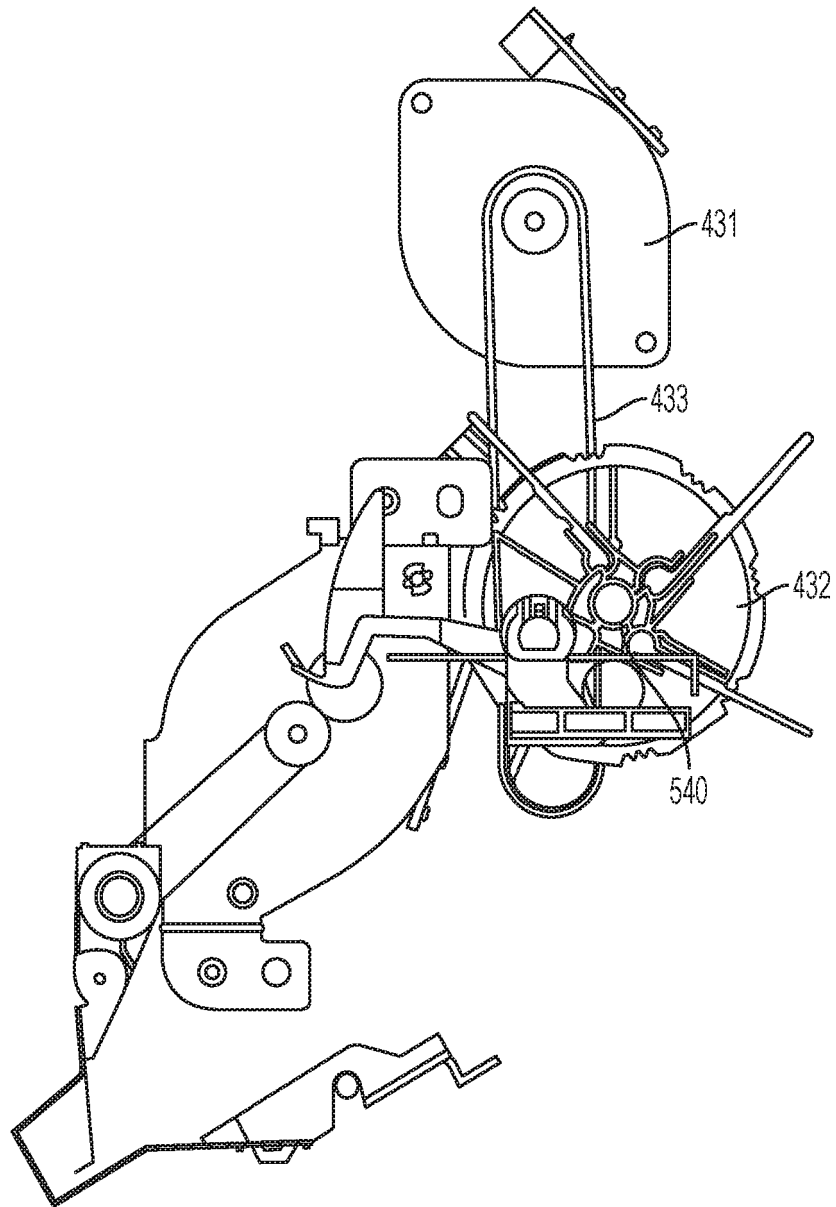


FIG. 4B

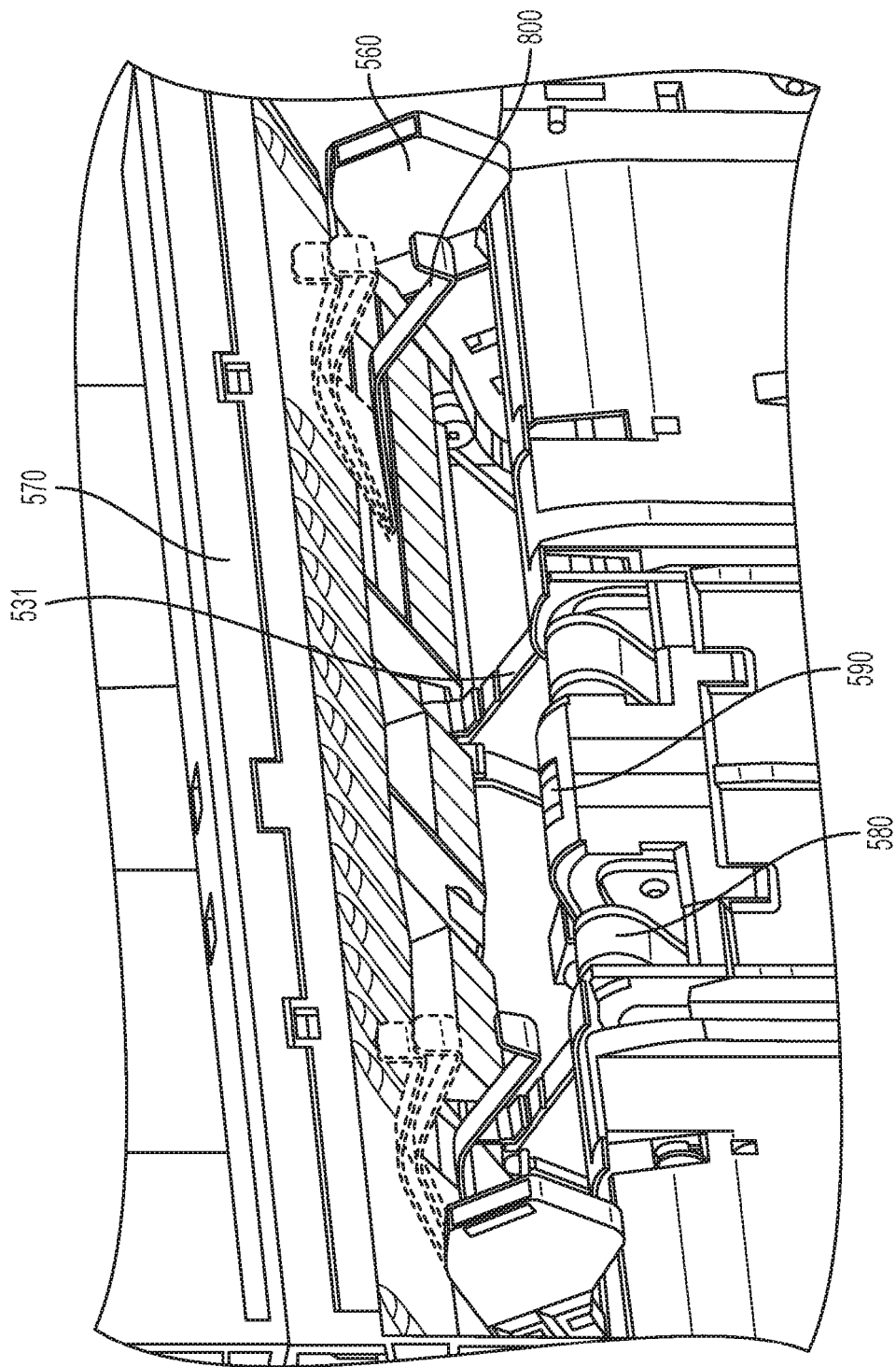


FIG. 5

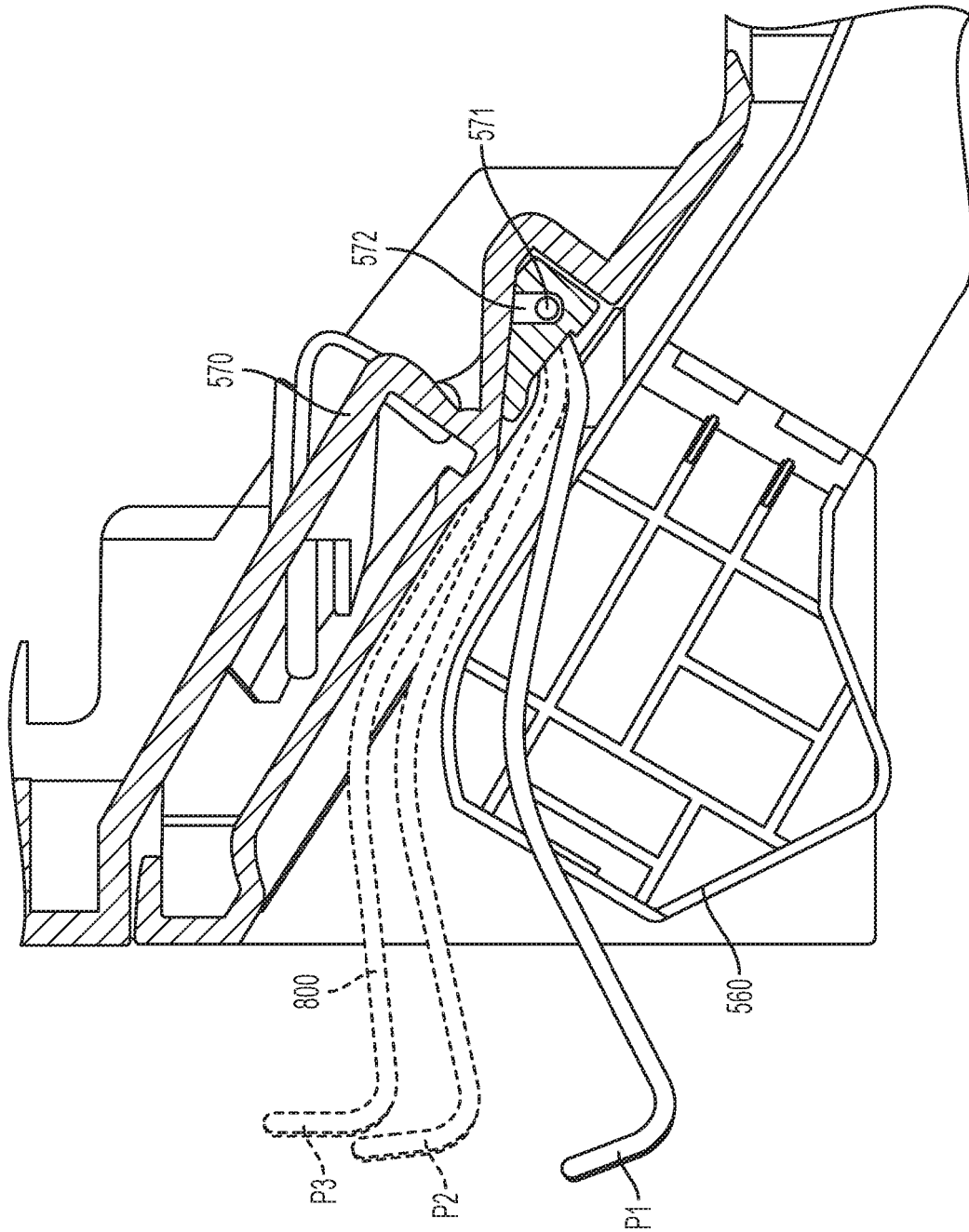


FIG. 6

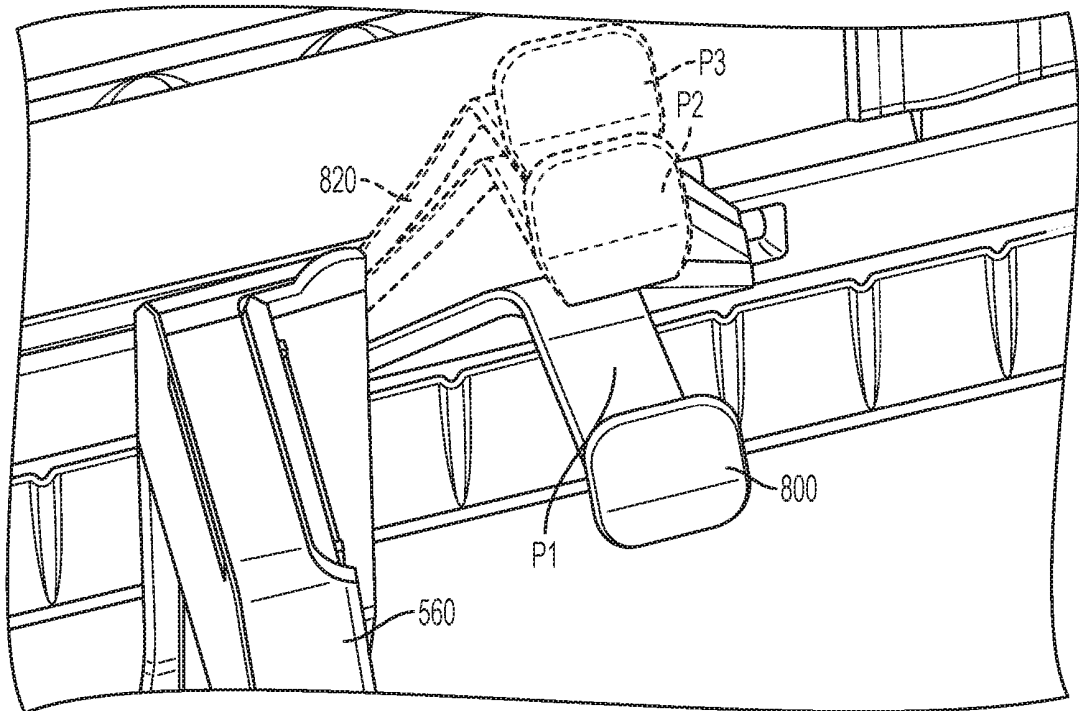


FIG. 7A

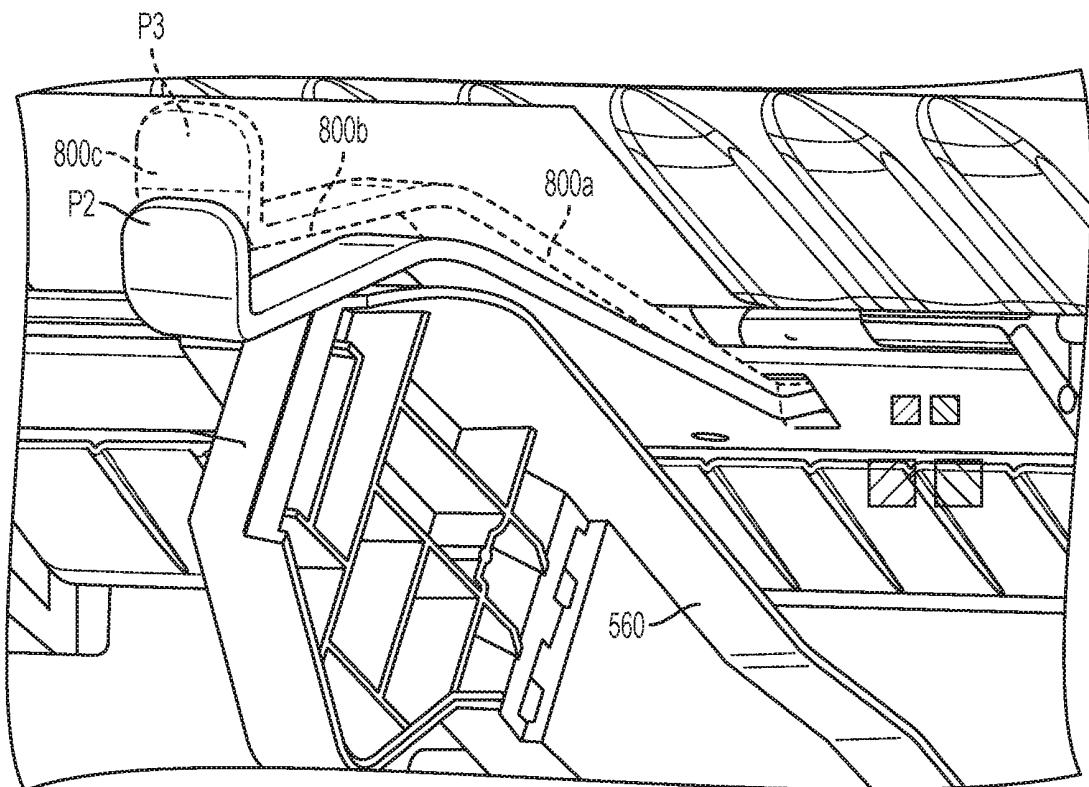


FIG. 7B

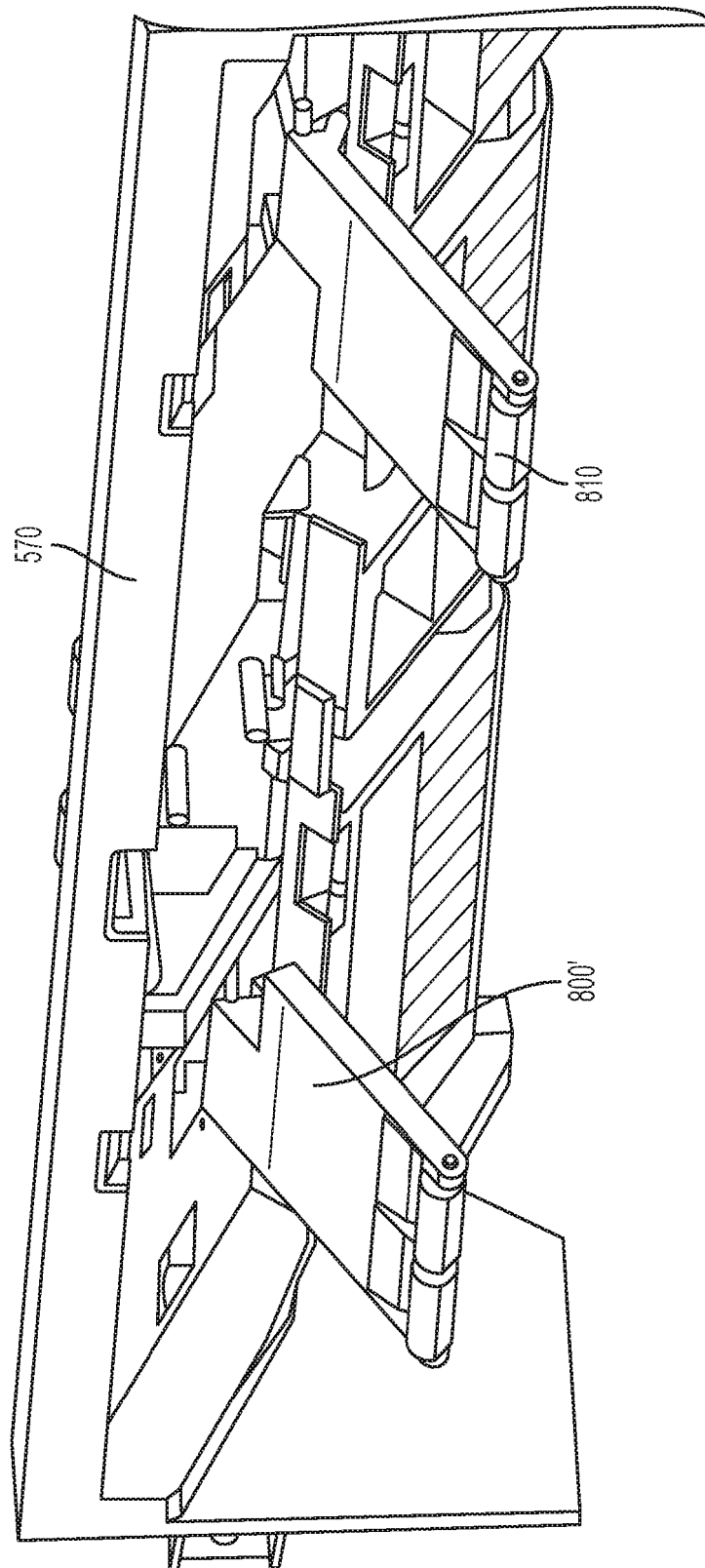


FIG. 8

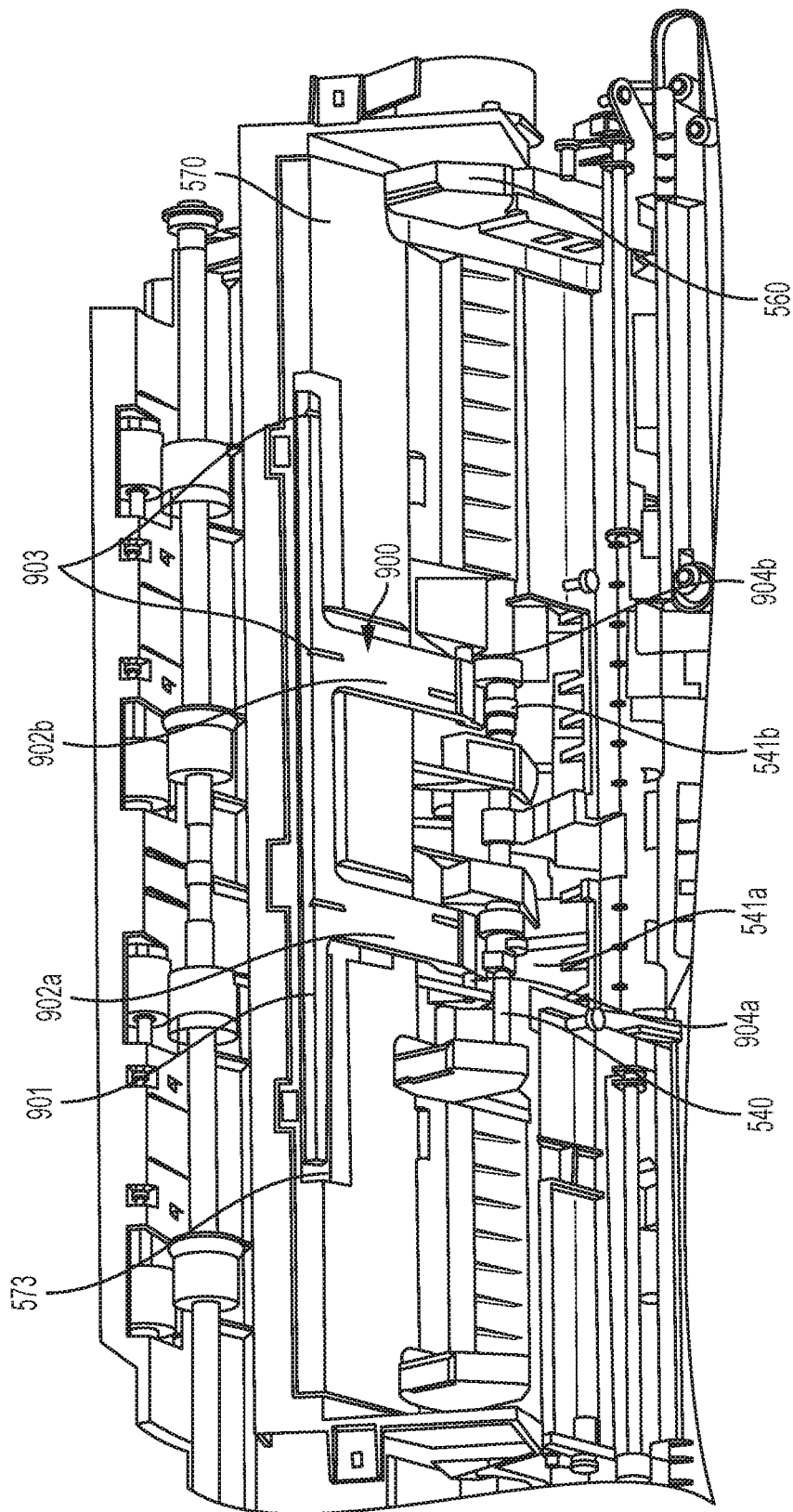


FIG. 9

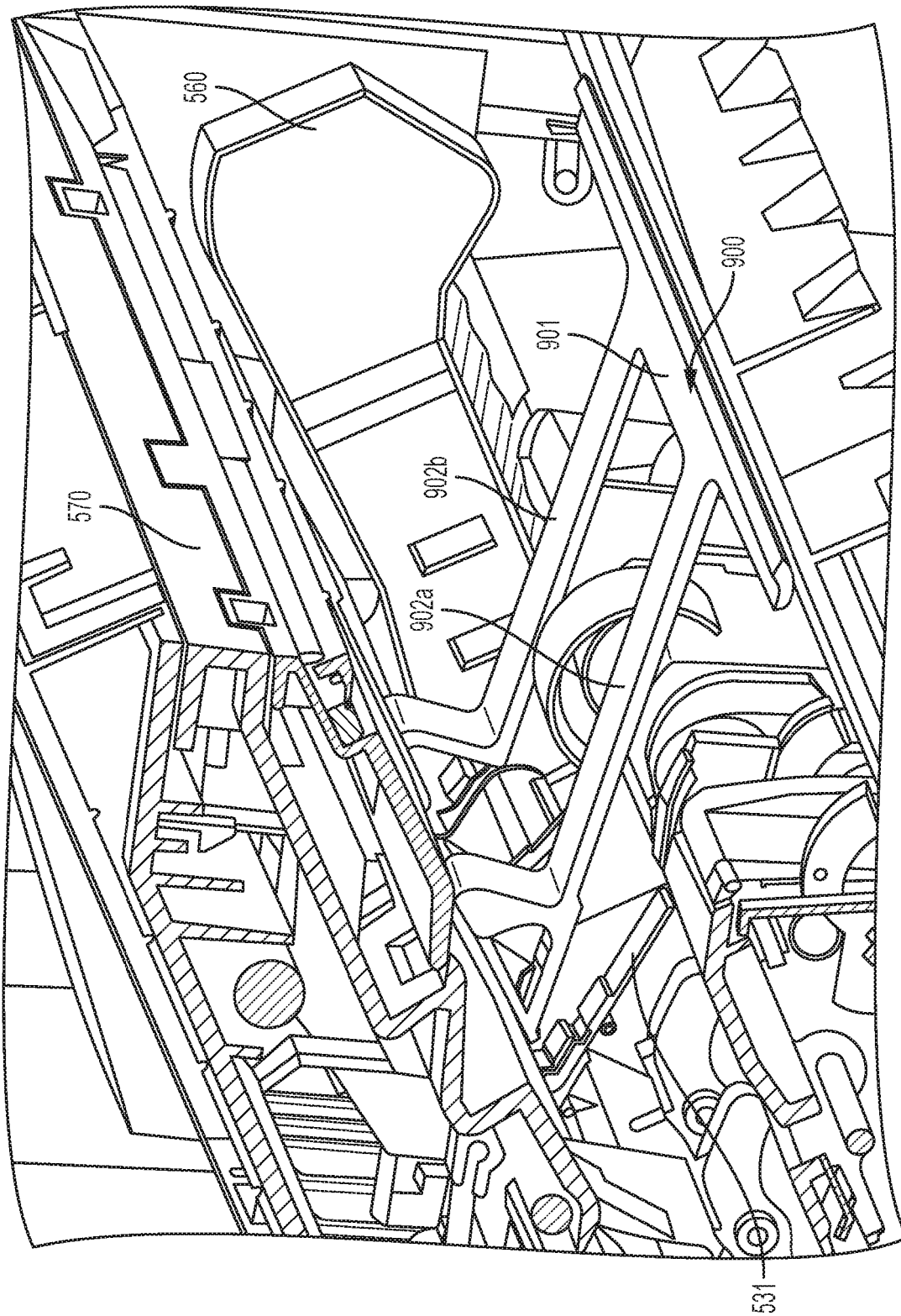


FIG. 10

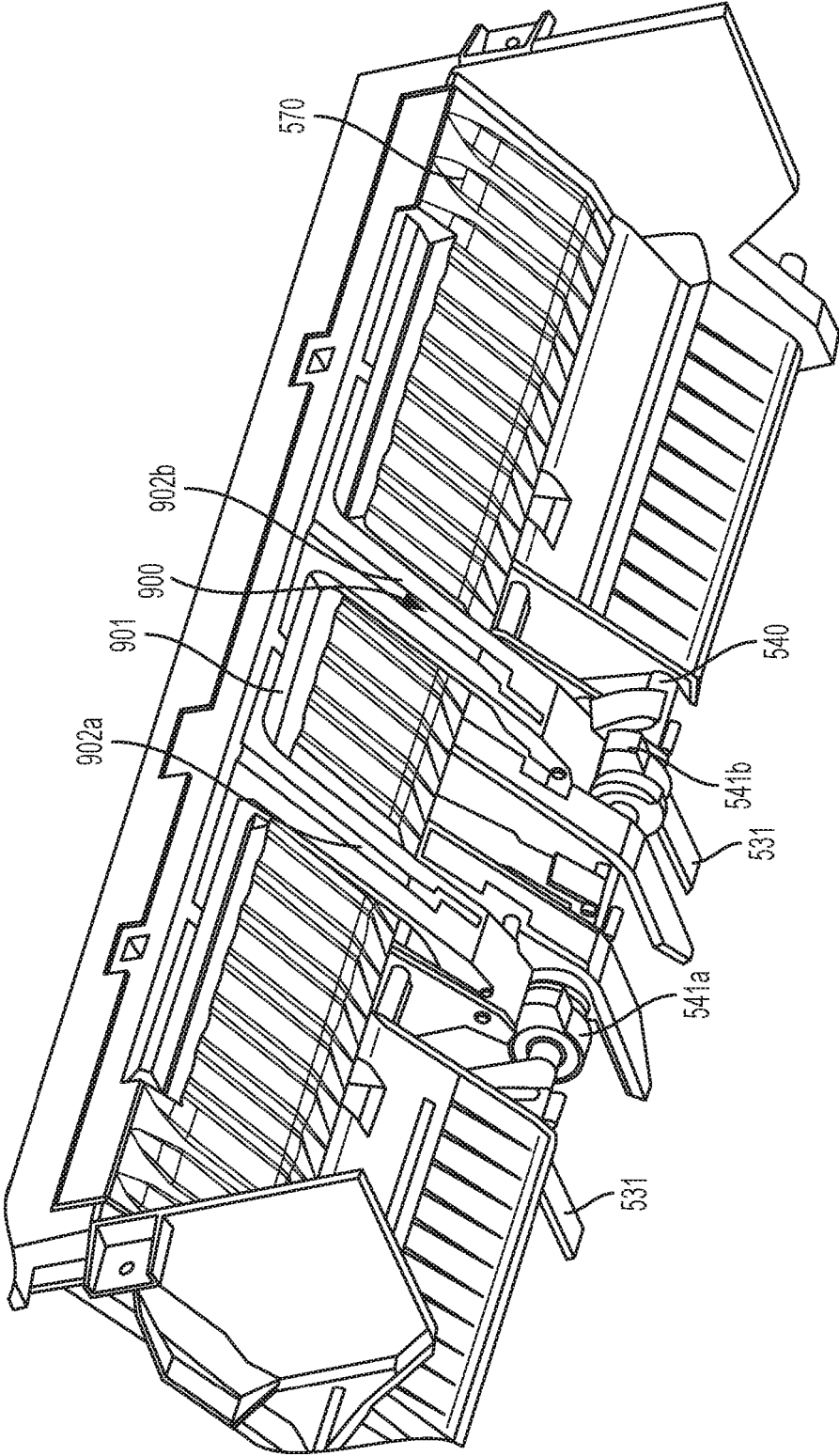


FIG. 11

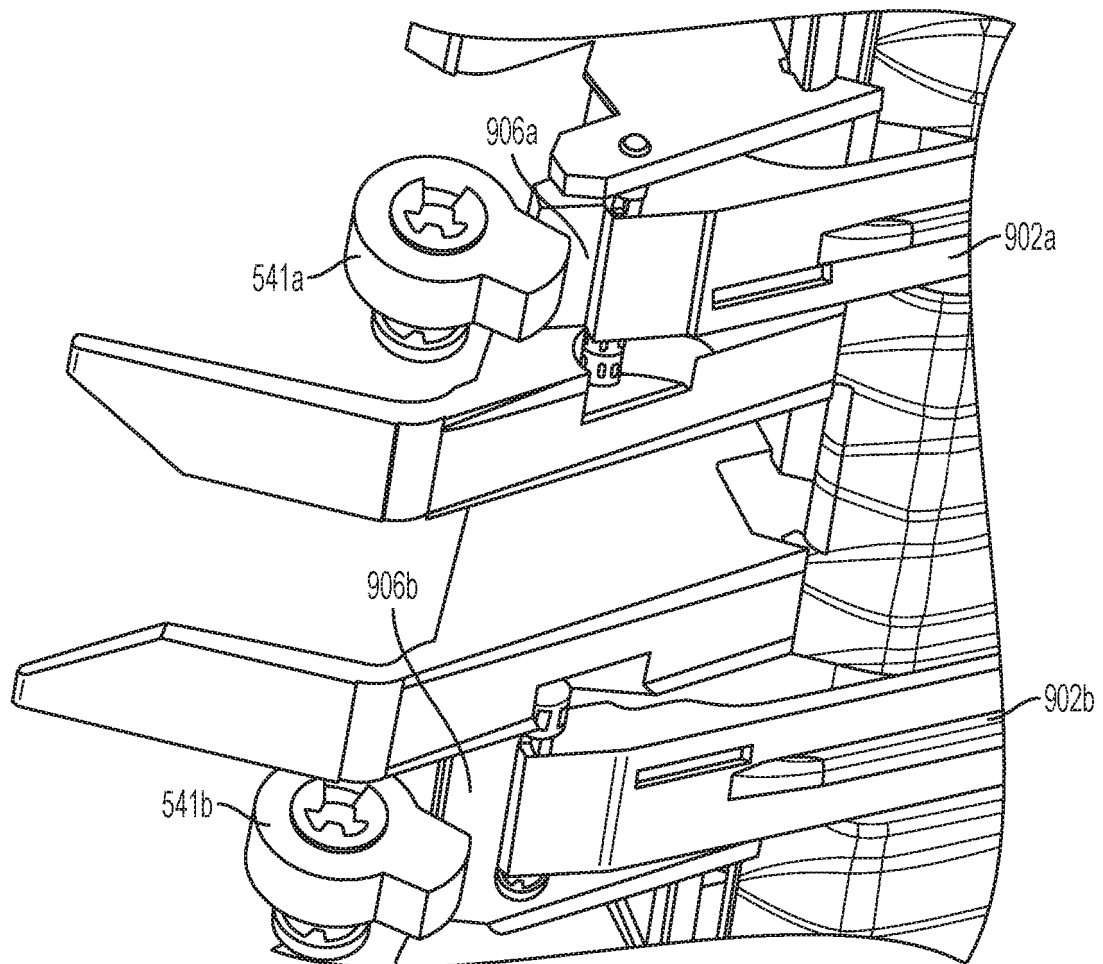


FIG. 12

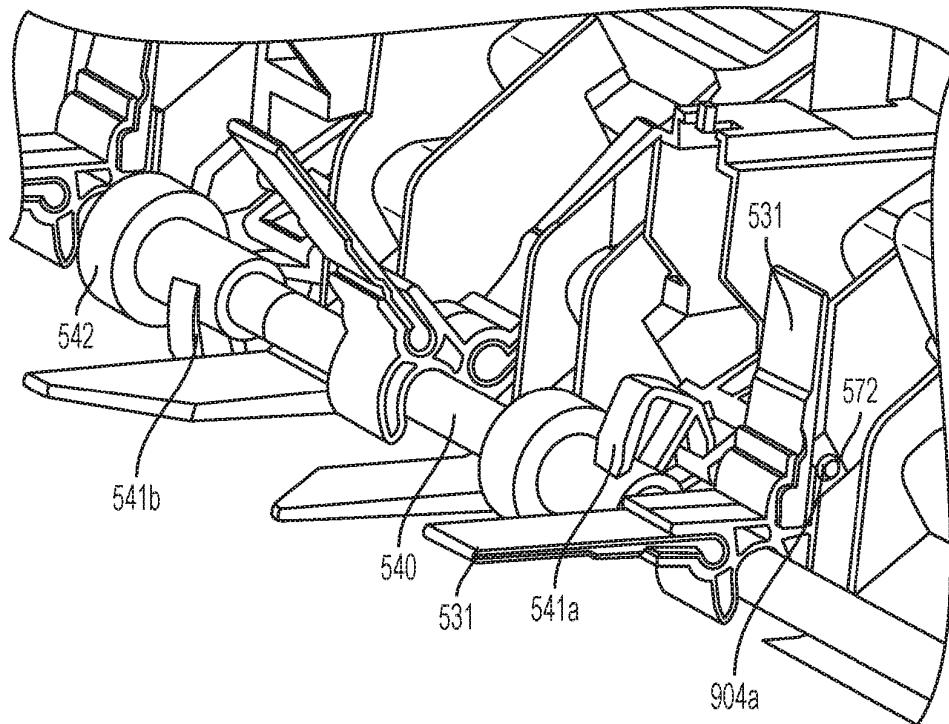


FIG. 13

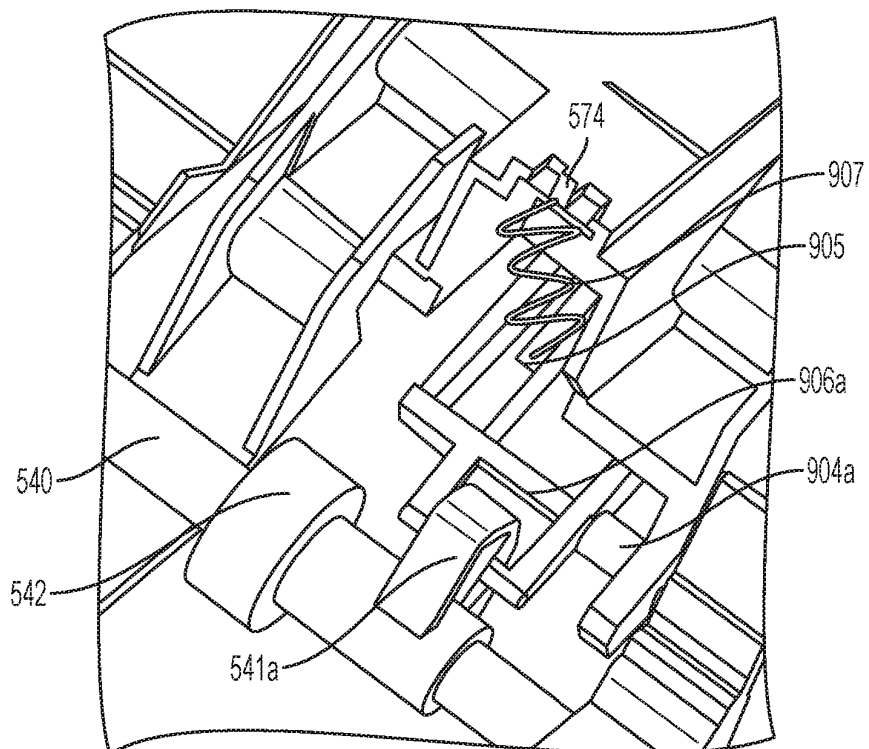


FIG. 14

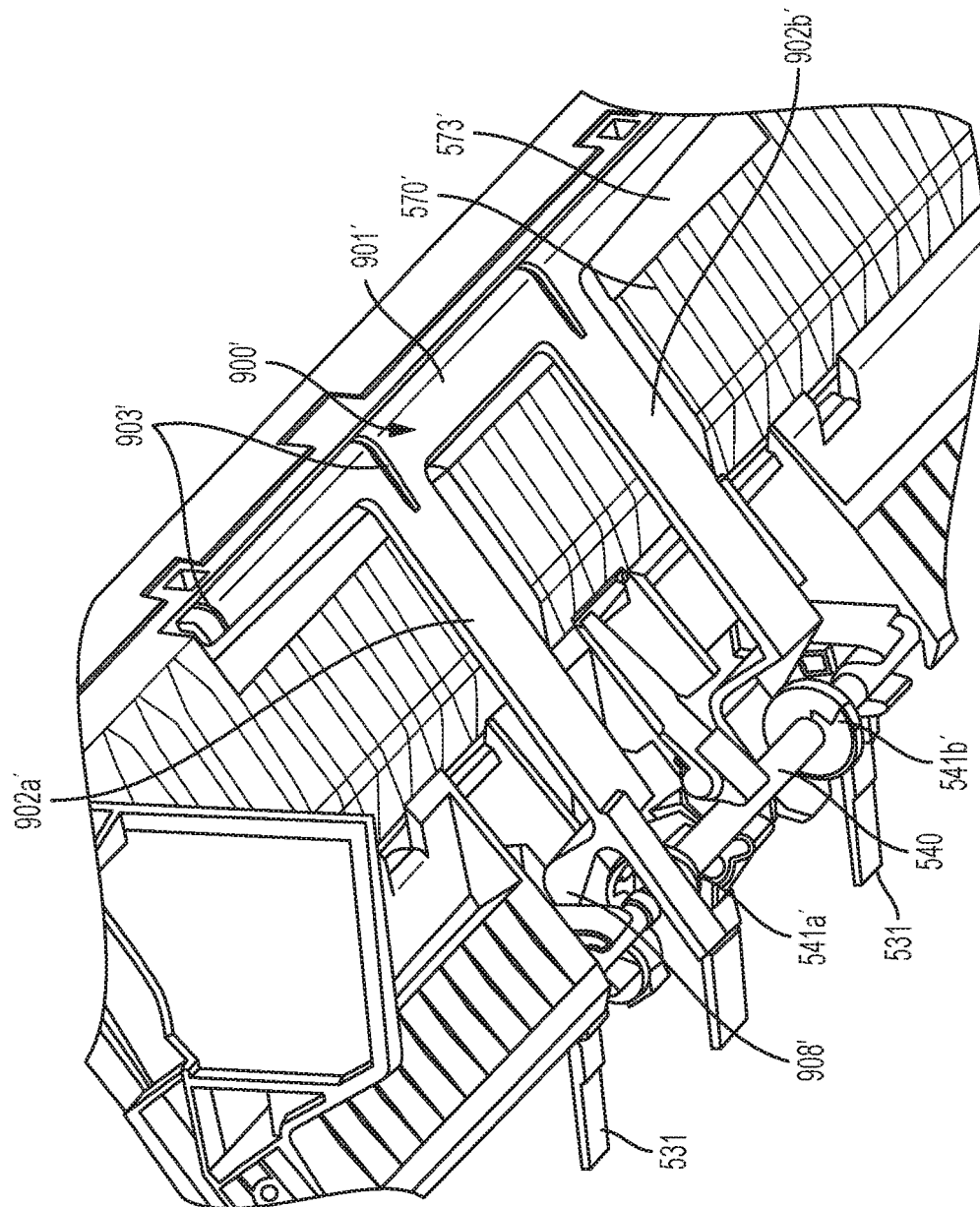


FIG. 15

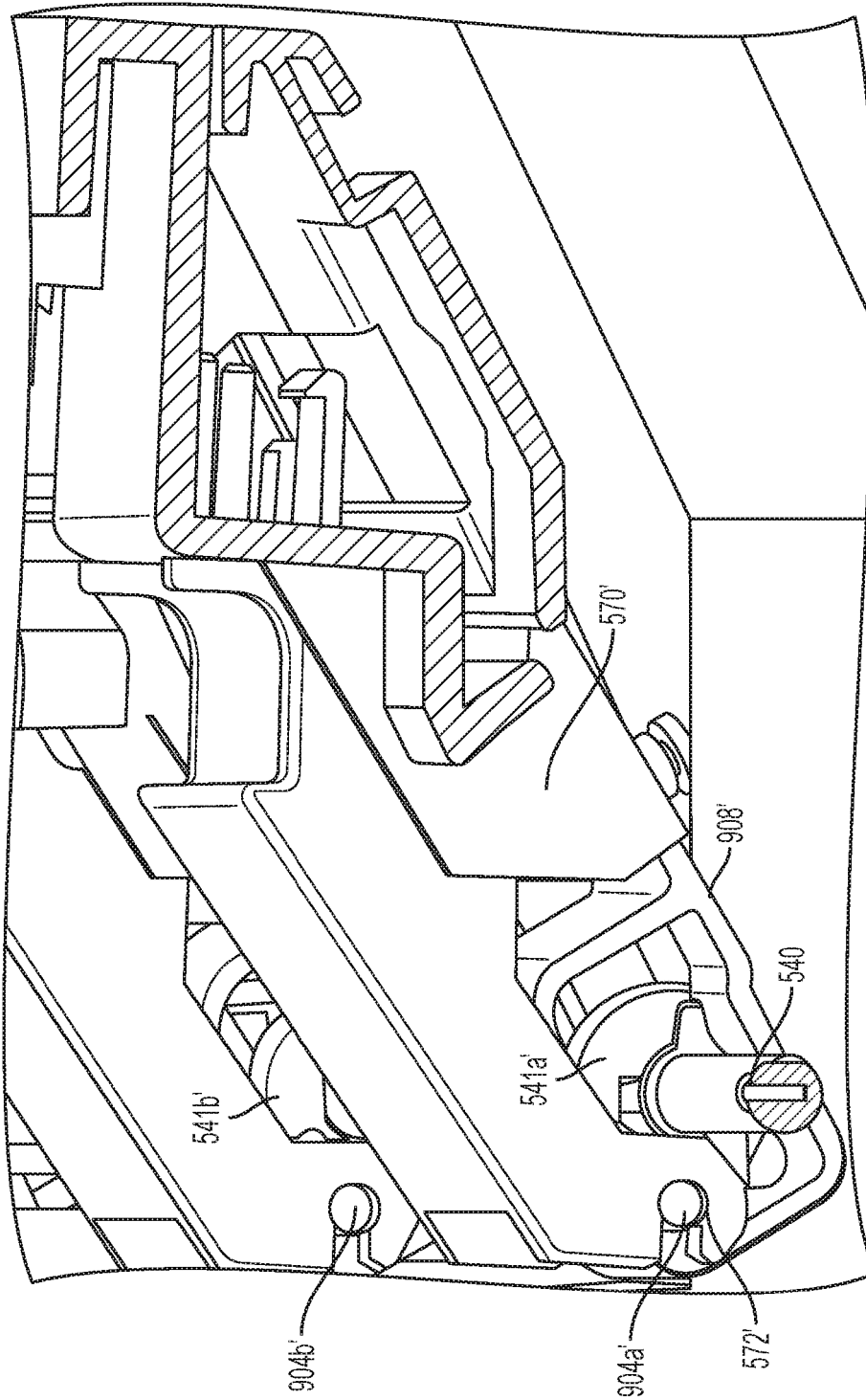


FIG. 16

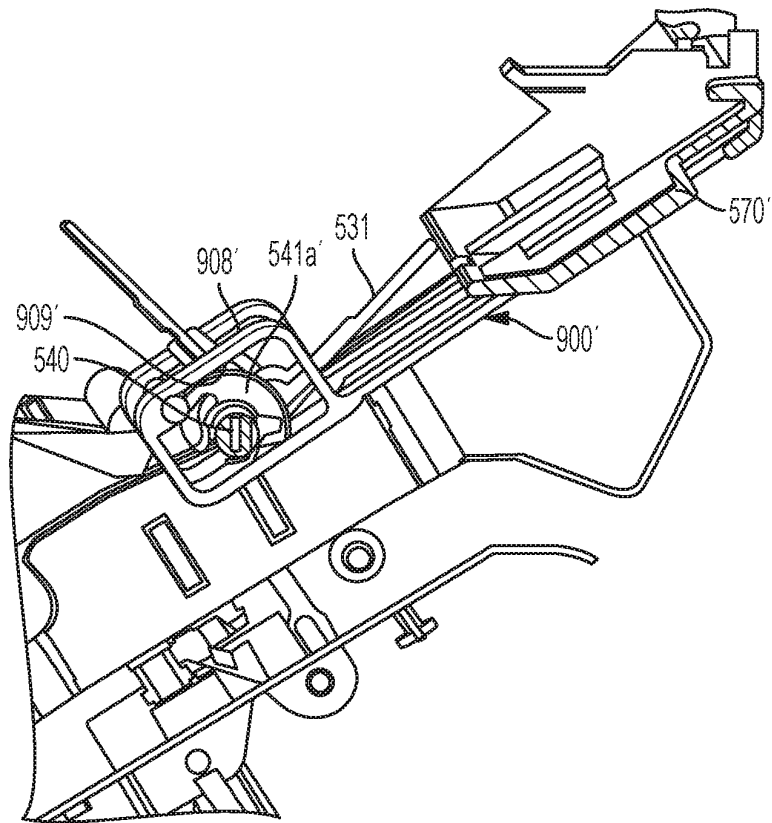


FIG. 17A

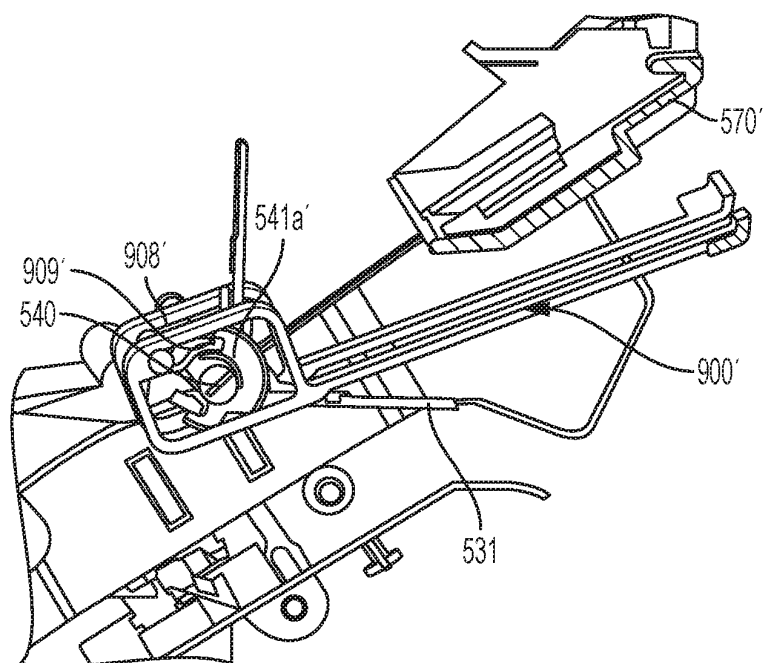


FIG. 17B

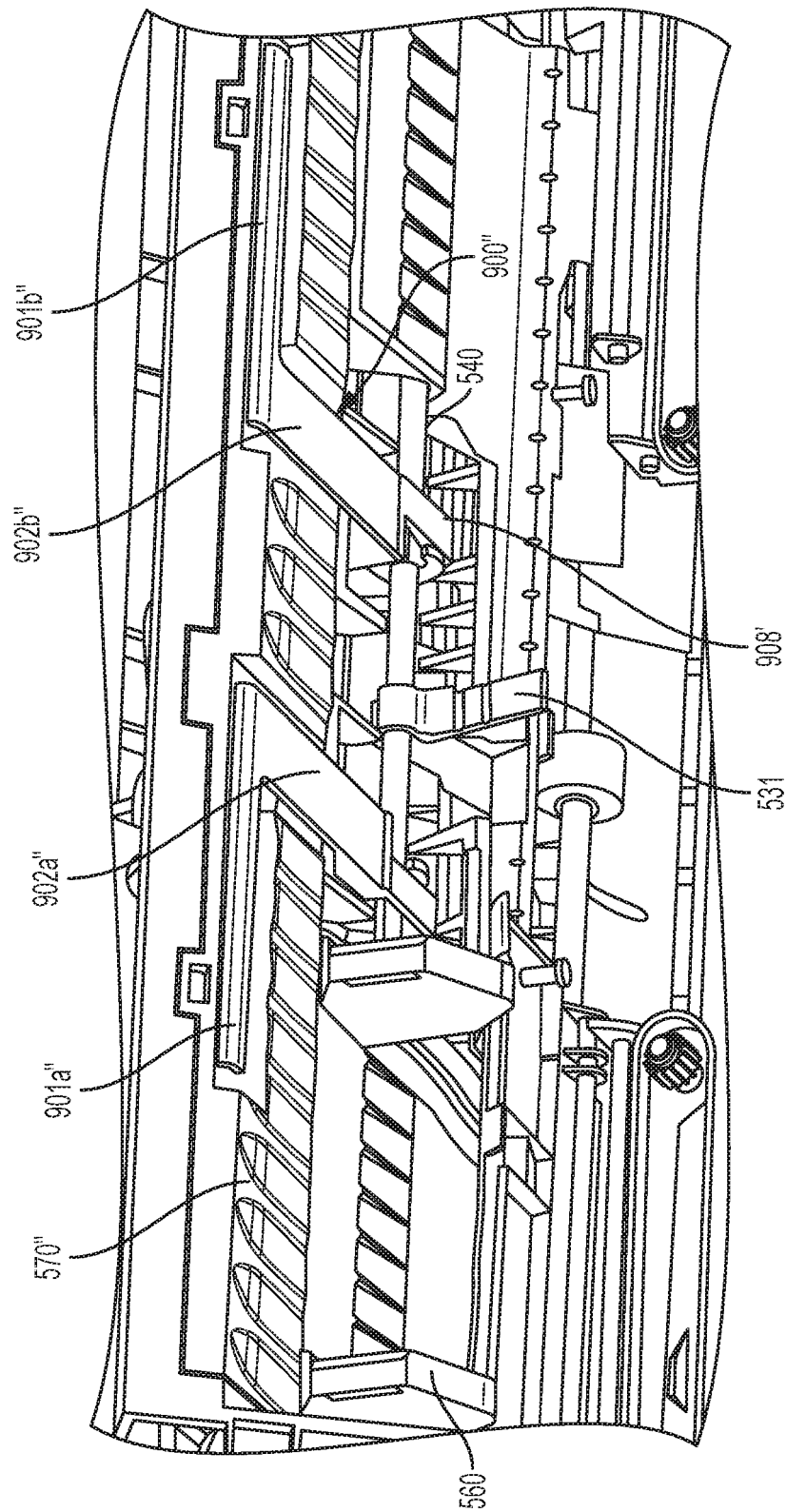


FIG. 18

REFERENCES CITED IN THE DESCRIPTION

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